SEAFLOOR MAPPING OF LONG ISLAND SOUND -

FINAL REPORT: PHASE I PILOT PROJECT APPENDICES

SUBMITTED TO:

THE LONG ISLAND SOUND CABLE FUND STEERING COMMITTEE

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STATE OF NEW YORK, DEPARTMENT OF ENVIRONMENTAL CONSERVATION, BUREAU OF MARINE RESOURCES;

CONNECTICUT SEA GRANT;

NEW YORK SEA GRANT;

AND

U.S. ENVIRONMENTAL PROTECTION AGENCY, REGIONS 1 AND 2

BY:

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LONG ISLAND SOUND MAPPING AND RESEARCH COLLABORATIVE
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June 2015

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Citations

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Long Island Sound Cable Fund Steering Committee, eds. (2015). "Seafloor Mapping of Long Island Sound – Final Report: Phase 1 Pilot Project." (Unpublished project report). U. S. Environmental Protection Agency Long Island Sound Study, Stamford, CT.

Long Island Sound Cable Fund Steering Committee, eds. (2015). "Seafloor Mapping of Long Island Sound – Final Report: Phase 1 Pilot Project Appendices." (Unpublished project report). U. S. Environmental Protection Agency Long Island Sound Study, Stamford, CT.

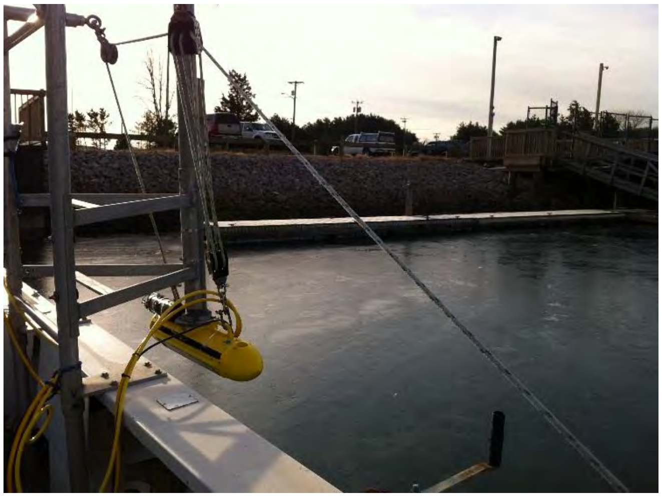
Appendix 1: Addendum to Seafloor Topography and Acoustic Intensity – LISMARC Shallow Water Mapping

Components for Long Island Sound Final Report

Summary

Staff (E. Shumchenia and C.Heil) from the University of Rhode Island (URI) Graduate School of Oceanography's Environmental Mapping Laboratory transited from Allen Harbor in Narragansett Bay, RI to Pilot Project Area F in Long Island Sound near Stratford, CT on August 22, 2012. On the URI R/V Shanna Rose, we deployed a pole-mounted Teledyne Benthos C3D interferometric sonar and a towed CHIRPIII subbottom. Over the course of 2 survey days, we mapped 1.25 square miles surrounding Charles Island and within Bridgeport Harbor. The goal of the survey was to demonstrate shallow water mapping capabilities and techniques, as well as overlap into areas of deeper water that had been mapped at much lower resolutions previously. A ~2 - 3 meter tidal amplitude in this survey area was extremely advantageous for shallow water mapping. During high tide, we were able to survey areas on the NOAA chart around Charles Island marked as intertidal. Ironically, however, the pole-mounted C3D ran aground in Bridgeport Harbor on the deep side of a NOAA-charted 18-foot contour.

Methods



The Teledyne Benthos C3D interferometric sonar system operated at 200 kHz, with vessel speed varying from 1 to 4 knots. Horizontal and vertical positional data were provided by a differential GPS and inertial motion unit (Applanix POS-MV). A CTD was fixed to the C3D polemount to obtain real-time temperature and salinity data for on-the-fly correction of signal travel time (sound velocity). A vessel and sensor diagram[1] and offsets[2] are provided with these deliverables. Interferometric data were acquired with Ocean Imaging Consultants (OIC) GeoDAS software in proprietary .oic format[3]. Subbottom data were acquired with SonarWizMap[4], using the GPS feed from the POS-MV, corrected with a layback value of 5 meters. A backup of the Hypack project file is available at the URI Environmental Mapping Laboratory[5]; the raw navigation file (.csv) for all survey transects is available as a part of these deliverables[6].

Interferometric data were processed using OIC Cleansweep version 3.4.27912. Side scan backscatter imagery was corrected using automated bottom tracking and manually-applied beam angle filters. Bathymetry was corrected for tide level using predicted tides available on www.tidesandcurrents.noaa.gov at the Bridgeport Harbor station[7]. Bathymetry data were filtered by depth and beam angle to reduce vertical scatter in the data. Both datasets were mosaicked at 0.5 meters. Side scan backscatter was exported in geotiff format[8], whereas bathymetry was exported in ASCII xyz format[9]. Bathymetry xyz files were brought into ArcGIS 9.3 and used to create a TIN (Triangular Irregular Network). The TIN was then converted to a raster with 0.5 meter resolution using the 3D Analyst toolbox. Rasters were exported as geotiffs[9].

RESULTS

The bathymetry and sidescan sonar mosaics obtained in LIS are shown in Figures 1-4. The bathymetry mosaic from the Charles Island site is shown in figure 1. The sidescan sonar mosaic from the Charles Island site is shown in Figure 2. The side-scan sonar mosaic reveals heterogenous bottom types within the survey area including what appear to be sand waves. The bathymetry mosaic for the Bridgeport Harbor area is shown in Figure 3. The sidescan sonar mosaic from Bridgeport Harbor is shown in Figure 4. The sidescan mosaic reveals a heterogenous bottom within the survey area. Features include sand waves in the channel, a rocky bottom adjacent to Pleasure Beach, and numerous man-made structures/objects. Overall, the surveys were successful in identifying areas of different bottom types and features that could be used to obtain a representative suite of ground-truth samples for habitat characterization. In addition, the large tidal range in Long Island Sound allowed surveys into a water depth of approximately 1 foot.

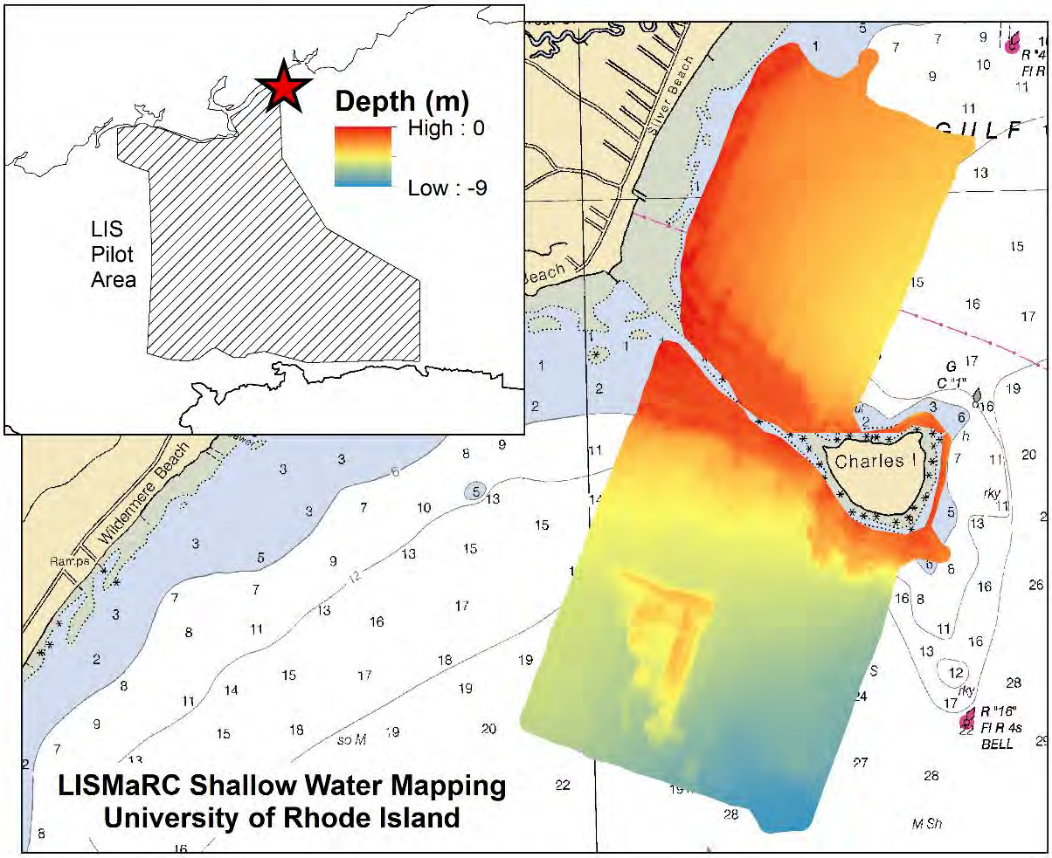


Figure 1. Bathymetry mosaic for Charles Island survey area.

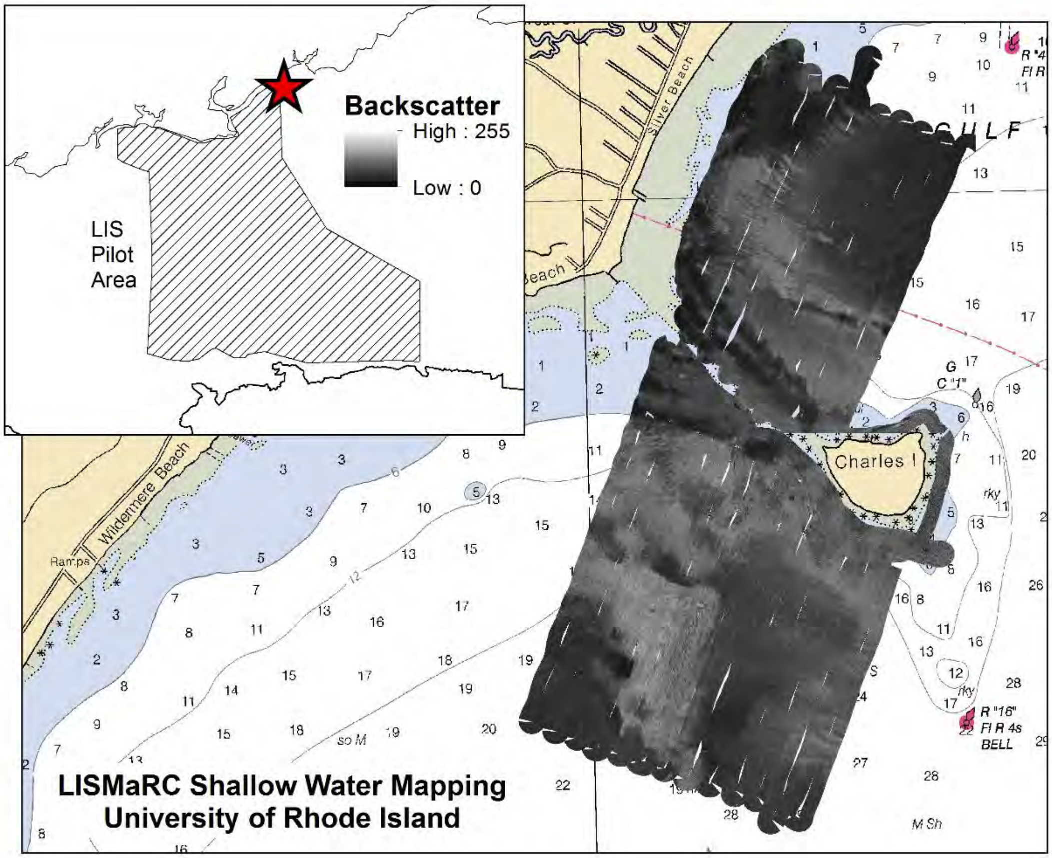


Figure 2. Sidescan sonar mosaic for Charles Island survey area.

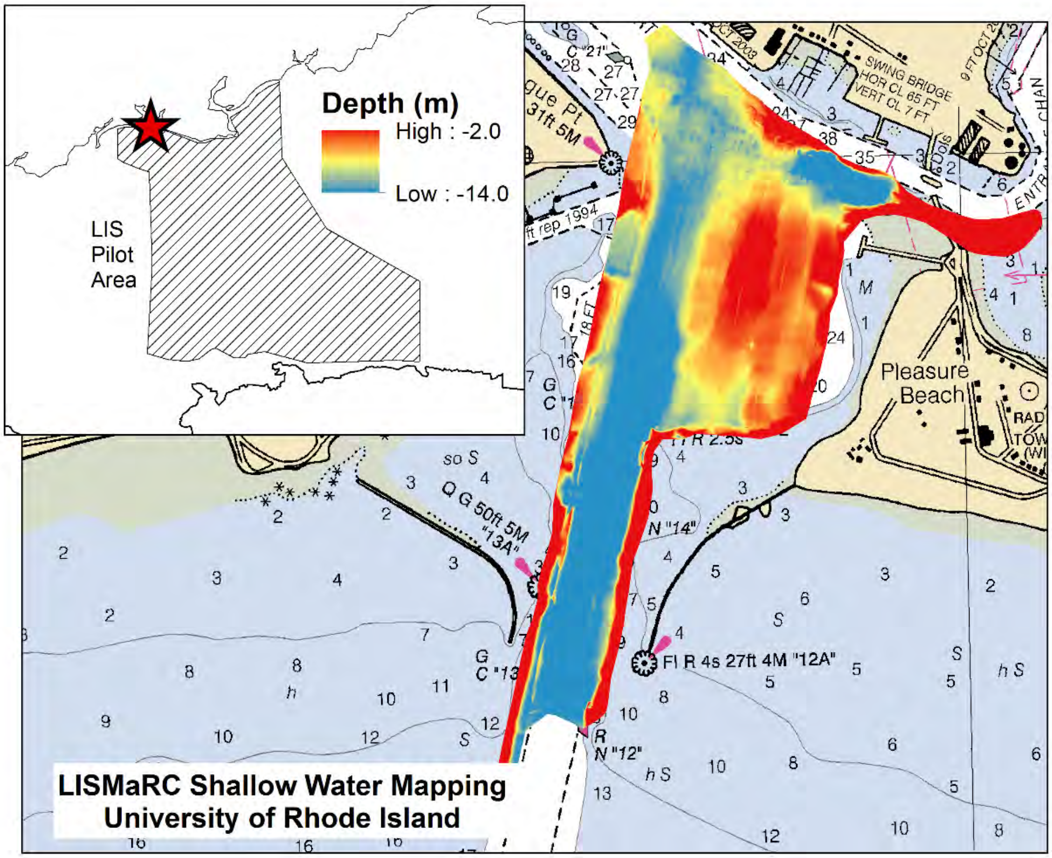


Figure 3. Bathymetry mosaic for Bridgeport Harbor survey area.

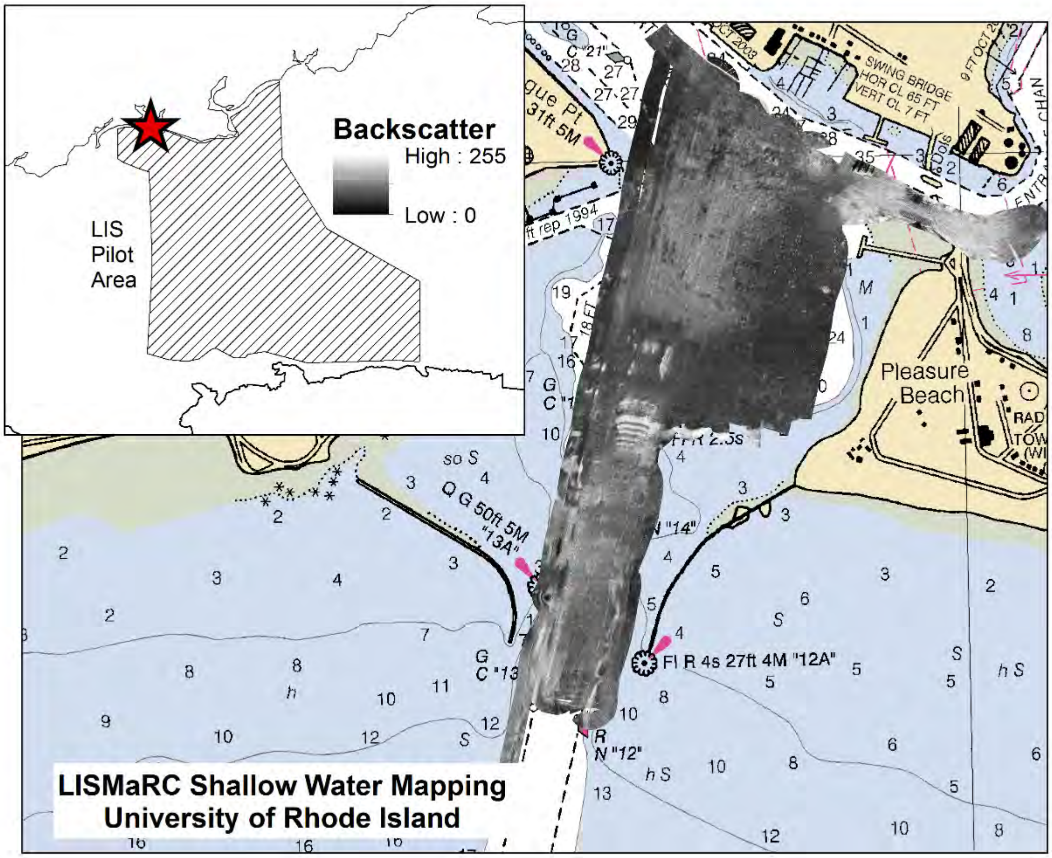


Figure 4. Sidescan sonar mosaic for Bridgeport Harbor survey area.

Appendix 2: Acoustic Survey Cruise Reports

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL OCEAN SERVICE

Data Acquisition & Processing Report

Type of Survey *Multibeam and Side Scan Sonar*

Project No. *OPR-E350-TJ-12, OPR-B340-TJ-12, OPR-B363-TJ-12, OPR-B370-TJ-12 S-B935-TJ-12*

Time Frame: 02APR2012 – 08NOV2012

LOCALITY

State *Virginia, New York, Connecticut*

General Locality *Southern Chesapeake Bay, VA; Long Island Sound, NY; Block Island Sound, RI; Eastern Long Island Sound, CT, NY Harbor and Vicinity*

2012

CHIEF OF PARTY

CDR Lawrence T. Krepp
National Oceanic and Atmospheric Administration

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A. EQUIPMENT

The methods and systems described in this report are used to meet Complete and Object detection coverage requirements and are in accordance with the Hydrographic Surveys Specifications and Deliverables Manual (2012), Hydrographic Survey Directives, and the Field Procedures Manual for Hydrographic Surveying (2012).

THE SURVEY VESSELS

The platforms used for data collection were the *NOAA Ship Thomas Jefferson,* (Figure A-1), *Hydrographic Survey Launches 3101 and 3102* (Figure A-1). *Thomas Jefferson* acquired multibeam echosounder (MBES) data, Side Scan Sonar (SSS) imagery and sound velocity profile (SVP) data. The vessel is equipped with a DT Marine Products tow winch (Model 307EHLWR) for side scan deployment, a DT Marine Oceanographic winch for CTD and bottom sample deployment, and a Brooke Ocean Technology MVP 100 Moving Vessel Profiler (MVP). Launches *3101* and *3102* acquired multibeam echosounder (MBES) data, vertical beam echosounder (VBES) data, Side Scan Sonar (SSS) imagery and sound velocity profile (SVP) data. Table A-1 presents the vessel characteristics for all platforms.

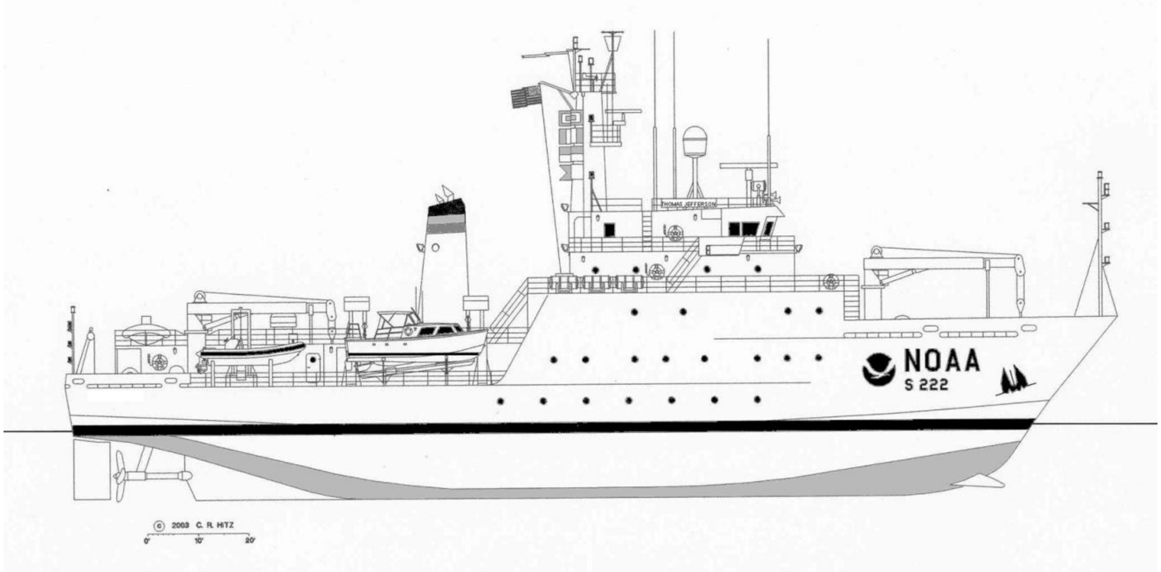


Figure A-1. NOAA Ship *Thomas Jefferson.*

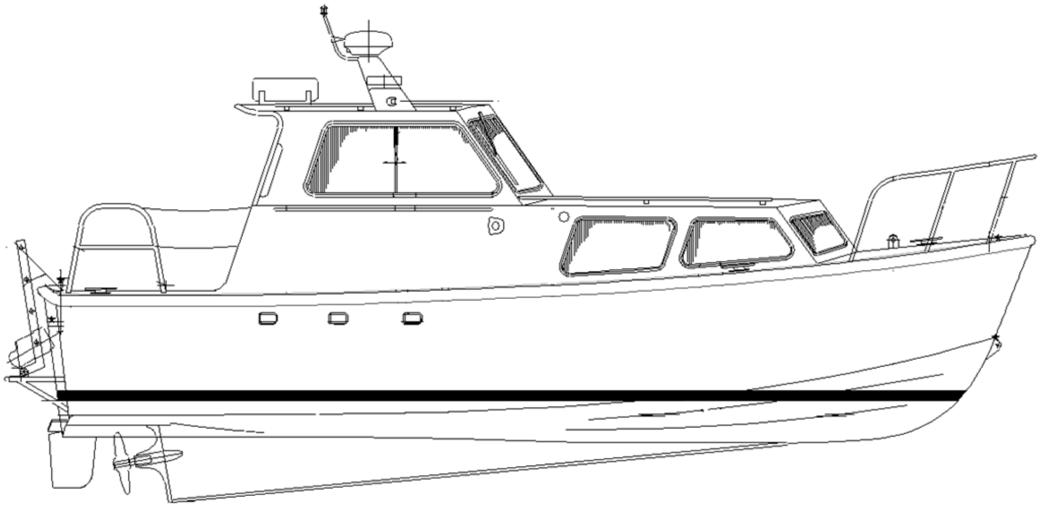


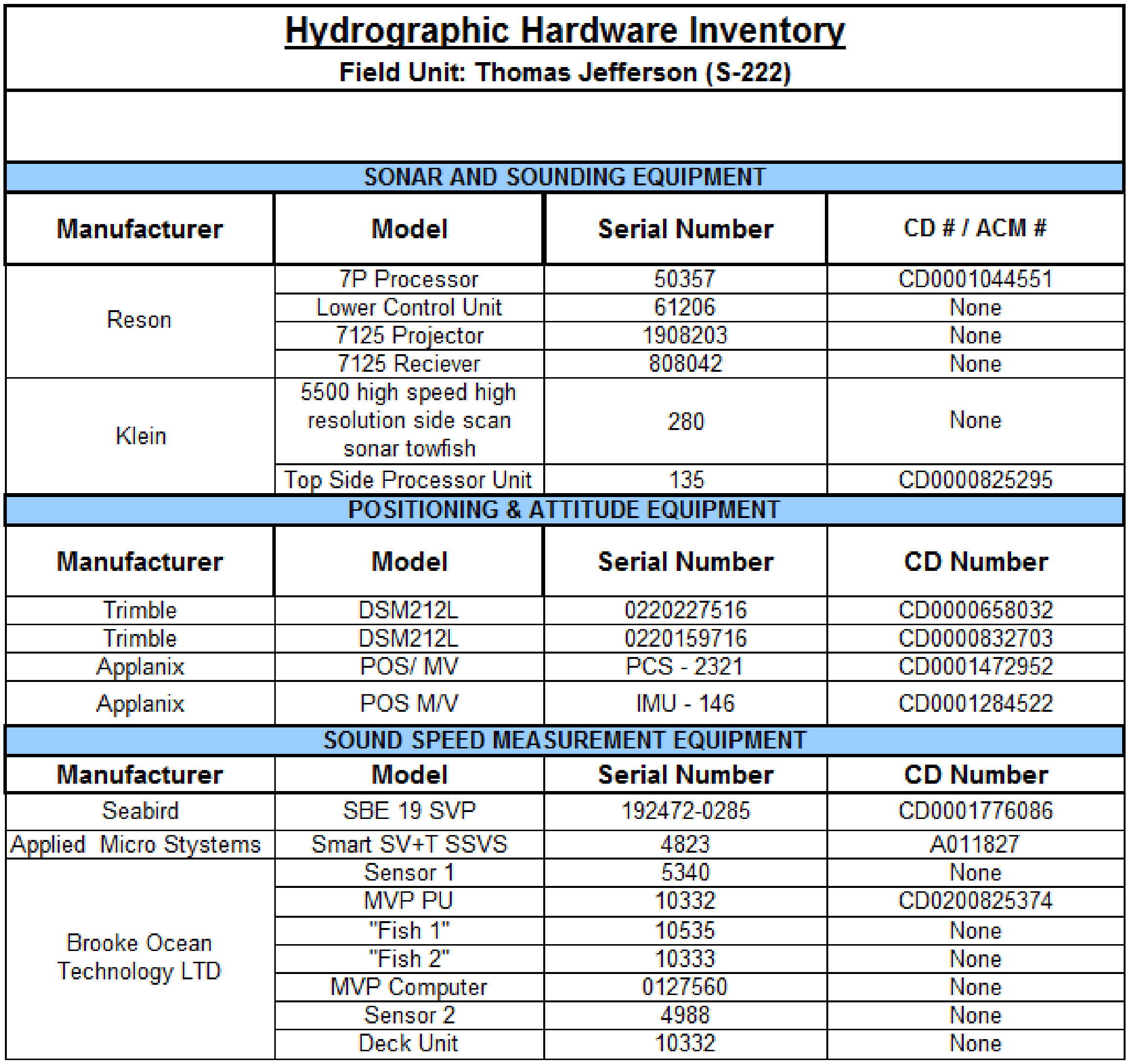
Figure A-2. Hydrographic Survey Launch 3101/3102.

Vessel Name	LOA (Ft)	Beam (Ft)	Draft (Ft)	Survey Speed	Date of last Vessel Survey	Date of last Dynamic Draft Measurement
NOAA Ship Thomas Jefferson	208’	45’	14.0’	5-10 kts	3/10/2012	4/3/2012
HSL 3101	31’	10’8”	5’2”	4-12 kts	1/20/2010	4/3/2012
HSL 3102	31’	10’8”	5’2”	4-12 kts	1/20/2010	4/4/2012

Table A-1. Survey Vessel Characteristics.

DATA ACQUISITION SYSTEMS

A complete listing of the data acquisition systems used for *OPR-E350-TJ-12, OPR-B340-TJ-12, OPR-B363-TJ-12, OPR-B370-TJ-12* are listed in the tables below:



Hydrographic Hardware Inventory

Field Unit: Thomas Jefferson (S-222)

SONAR AND SOUNDING EQUIPMENT

Manufacturer	Model	Serial Number	CD # / ACM #
Reson	7P Processor	50357	CD0001044551
	Lower Control Unit	61206	None
	7125 Projector	1908203	None
	7125 Reciever	808042	None
Klein	5500 high speed high resolution side scan sonar towfish	280	None
	Top Side Processor Unit	135	CD0000825295

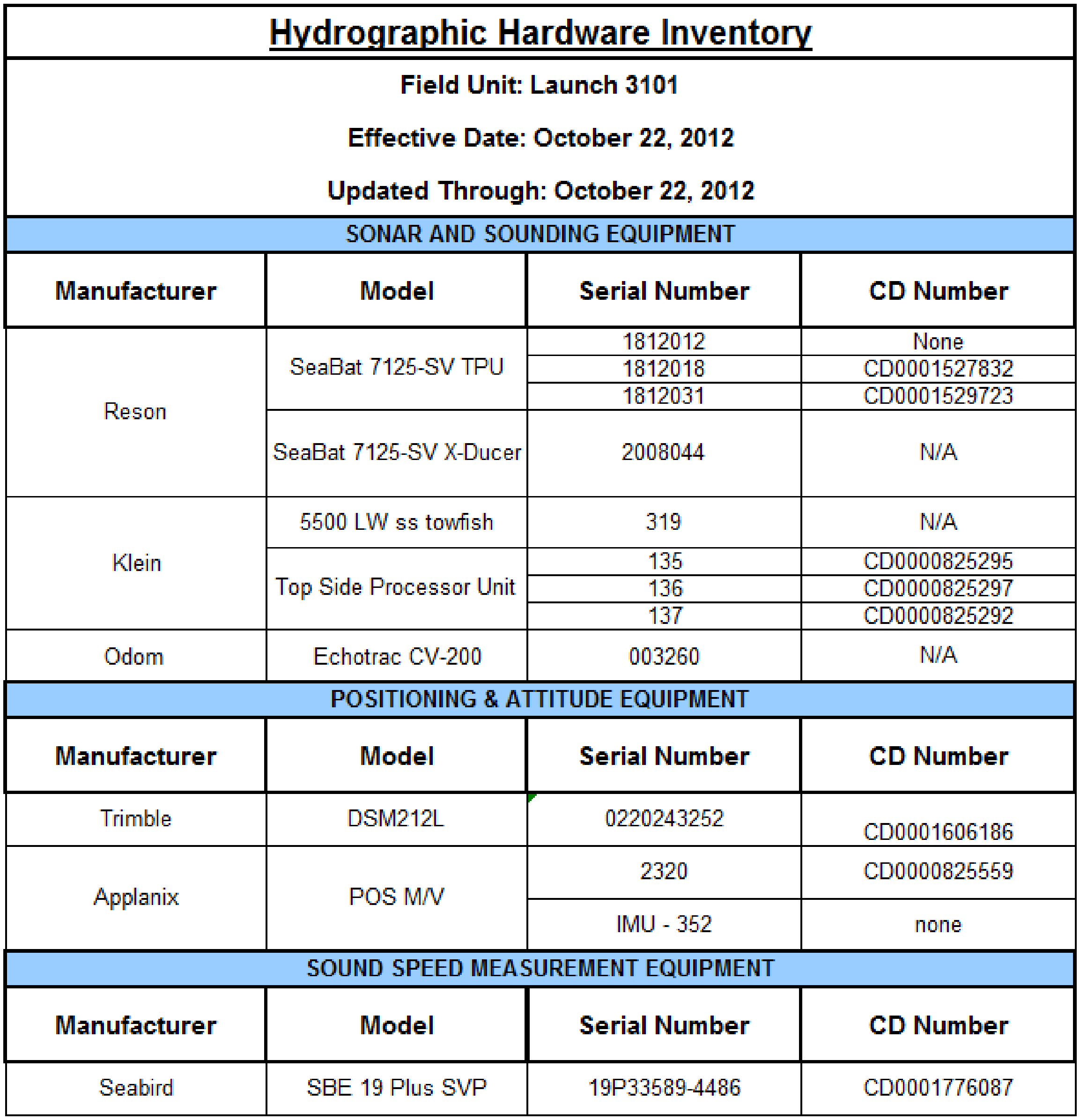
POSITIONING & ATTITUDE EQUIPMENT

Manufacturer	Model	Serial Number	CD Number
Trimble	DSM212L	0220227516	CD0000658032
Trimble	DSM212L	0220159716	CD0000832703
Applanix	POS/ MV	PCS - 2321	CD0001472952
Applanix	POS M/V	IMU - 146	CD0001284522

SOUND SPEED MEASUREMENT EQUIPMENT

Manufacturer	Model	Serial Number	CD Number
Seabird	SBE 19 SVP	192472-0285	CD0001776086
Applied Micro Stystems	Smart SV+T SSVS	4823	A011827
Brooke Ocean Technology LTD	Sensor 1	5340	None
	MVP PU	10332	CD0200825374
	"Fish 1"	10535	None
	"Fish 2"	10333	None
	MVP Computer	0127560	None
	Sensor 2	4988	None
	Deck Unit	10332	None

Table A-2 - *Thomas Jefferson* S222 Acquisition Systems.



Hydrographic Hardware Inventory

Field Unit: Launch 3101

Effective Date: October 22, 2012

Updated Through: October 22, 2012

SONAR AND SOUNDING EQUIPMENT

Manufacturer	Model	Serial Number	CD Number
Reson	SeaBat 7125-SV TPU	1812012	None
		1812018	CD0001527832
		1812031	CD0001529723
	SeaBat 7125-SV X-Ducer	2008044	N/A
Klein	5500 LW ss towfish	319	N/A
	Top Side Processor Unit	135	CD0000825295
		136	CD0000825297
		137	CD0000825292
Odom	Echotrac CV-200	003260	N/A

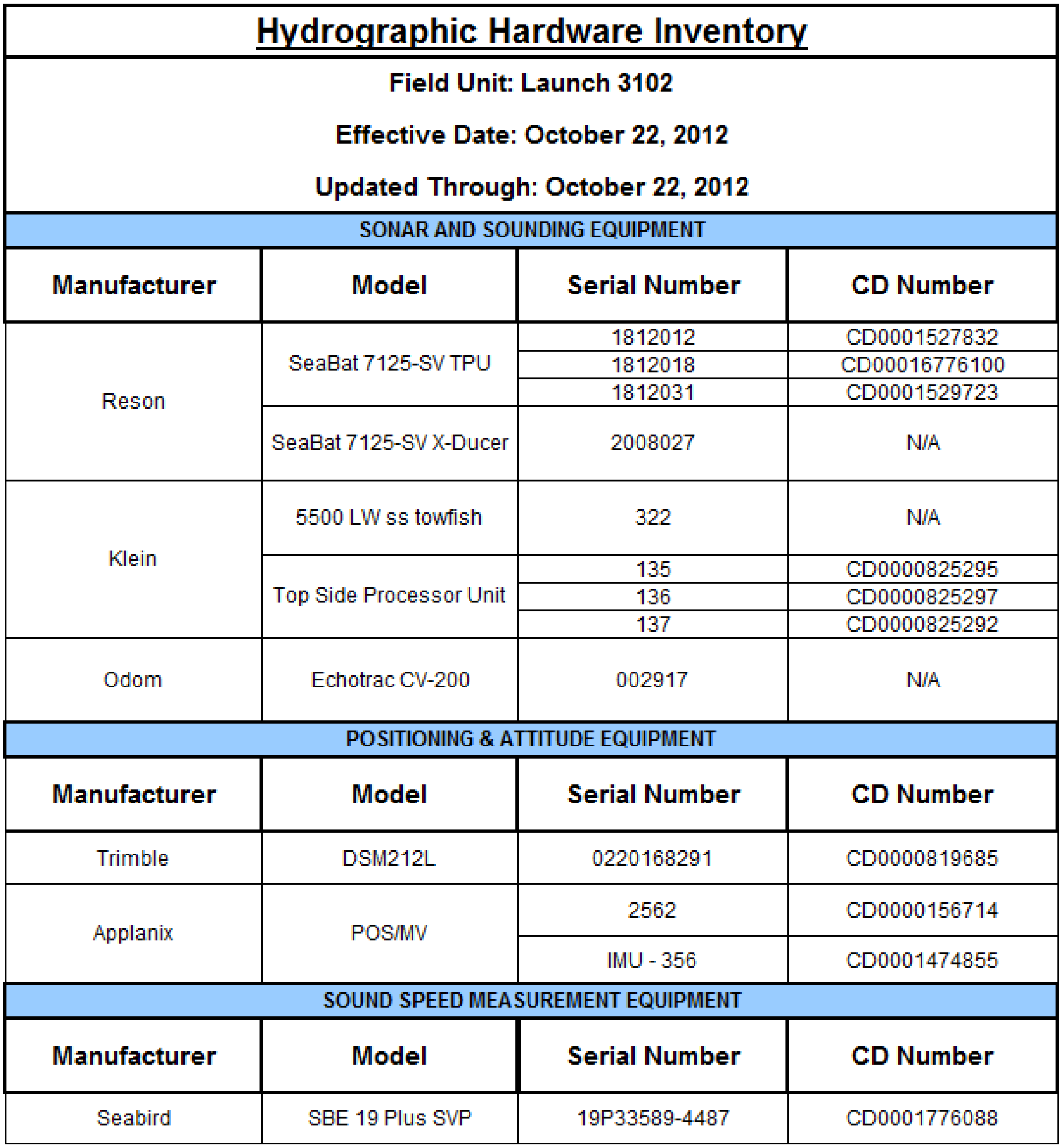
POSITIONING & ATTITUDE EQUIPMENT

Manufacturer	Model	Serial Number	CD Number
Trimble	DSM212L	0220243252	CD0001606186
Applanix	POS M/V	2320	CD0000825559
		IMU - 352	none

SOUND SPEED MEASUREMENT EQUIPMENT

Manufacturer	Model	Serial Number	CD Number
Seabird	SBE 19 Plus SVP	19P33589-4486	CD0001776087

Table A-3- *HSL 3101* Acquisition Systems.



Hydrographic Hardware Inventory

Field Unit: Launch 3102

Effective Date: October 22, 2012

Updated Through: October 22, 2012

SONAR AND SOUNDING EQUIPMENT

Manufacturer	Model	Serial Number	CD Number
Reson	SeaBat 7125-SV TPU	1812012	CD0001527832
		1812018	CD00016776100
		1812031	CD0001529723
	SeaBat 7125-SV X-Ducer	2008027	N/A
Klein	5500 LW ss towfish	322	N/A
	Top Side Processor Unit	135	CD0000825295
		136	CD0000825297
		137	CD0000825292
Odom	Echotrac CV-200	002917	N/A

POSITIONING & ATTITUDE EQUIPMENT

Manufacturer	Model	Serial Number	CD Number
Trimble	DSM212L	0220168291	CD0000819685
Applanix	POS/MV	2562	CD0000156714
		IMU - 356	CD0001474855

SOUND SPEED MEASUREMENT EQUIPMENT

Manufacturer	Model	Serial Number	CD Number
Seabird	SBE 19 Plus SVP	19P33589-4487	CD0001776088

Table A-4 *HSL 3102* Acquisition Systems.

A.1 ODOM Echotrac CV200

The Echotrac CV-200 is a dual-frequency digital recording echosounder system with a digital recorder. The systems high frequency setting is 200 kHz, low frequency is 24 kHz. It is hull-mounted on HSL *3101*and *3102*.

On Launches *3101* and *3102*, the transducer is mounted on the port side forward of the retractable arm that accommodates the RESON 7125-SV (Figure A-3). The installation of the Odom on Launch *3101, 3102* allows simultaneous acquisition of KLEIN 5000 side scan with general survey-grade bathymetry when the ODOM is operated in either low or high frequency mode.

Figure A-3 - Odom Vertical Beam on *3101 / 3102.*

For the purposes of calculating total propagated error (TPU), the ODOM Echotrac CV-200 is assumed to be a single-frequency multibeam transducer with one beam. The maximum across-track and along-track beam angles are assumed to be identical at a value of 7.5°. The sonar is assumed to have a pulse length of 0.1 ms at 100 kHz and a ping rate of 20 Hz.

The ODOM Echotrac is used with side scan sonar to meet NOAA requirements for object detection.

Owing to its wide beamwidth, patch tests are not conducted to solve for mounting angle biases for ODOM Echotrac data. During typical acquisition conditions, the high-frequency beamwidth is wide enough to receive a primary-lobe hit at nadir regardless of vessel attitude. This breaks down, however, when the vessel pitches more than 3° or rolls more than 5°. Care is taken to avoid using the ODOM as the primary source of bathymetry in situations where the pitch or roll would cause attitude artifacts or side-lobe hits.

A.2 RESON SeaBat 7125 Multibeam Echosounder

The RESON SeaBat 7125 system is a single-frequency, digital recording multibeam echosounder with a central frequency of 400 kHz. The RESON 7125 system aboard *Thomas Jefferson* is installed in a steel housing assembly with hydrodynamic shape mounted to a pylon extending from the starboard hull of the ship (Figure A-4).

Figure A-4. 7125 Housing on *Thomas Jefferson*.

The RESON 7125 forms 256 beams and can be set to interpolate to 512 beams. The RESON 7125 can also be set to acquire equi-distant or equi-angular beam spacing. Each beam in the receive array has a 0.5° across-track resolution and 1° along-track resolution. The RESON 7125 has a maximum ping rate of 48 Hz and can achieve a full swath width to a depth of 75m. Standard operating procedure on *Thomas Jefferson* is to acquire 512 beam, equi-distant bathymetry.

The sonar contribution to the total propagated error is computed using parameters provided by the manufacturer and distributed with Caris HIPS.

The RESON 7125 performs active beam steering to correct for sound velocity at the transducer head using an Applied Microsystems LTD Sound Velocity and Temperature Smart Sensor. This sensor will be discussed in more detail in the Sound Velocity Equipment Section.

The user selectable range scale on the RESON 7125 was adjusted using the "autopilot" settings, or by hand.

A.3 RESON SeaBat 7125-SV Multibeam Echosounder

The RESON 7125-SV system aboard Launches *3101, 3102* are installed on a RESON Seabat 7125 mounting bracket deployed on a retractable arm from the hull. (Figure A-5).

Figure A-5. 7125-SV Housing on Launch *3101/3102.*

The RESON 7125-SV forms 256 beams and can be set to interpolate to 512 beams in the receive array and can be set to acquire equi-distant or equi-angular beam spacing. Standard operating procedure on *Thomas Jefferson* is to acquire 512 equi-distant bathymetry. The 400 kHz frequency has a 0.54° across-track resolution and 1° along-track resolution. The 200 kHz frequency has a 1.1° across-track resolution and 2.2° along-track resolution. The RESON 7125-SV has a maximum ping rate of 50 pings/s and can maintain a full swath width in depths of 1-75 m for the 400 kHz, and 1-150 m for the 200 kHz systems.

The sonar contribution to the total propagated error is computed using parameters provided by the manufacturer and distributed with Caris HIPS.

The RESON 7125-SV performs active beam steering to correct for sound velocity at the transducer head using a RESON Sound Velocity Probe (SVP) 70. This sensor will be discussed in more detail in the Sound Velocity Equipment Section.

The RESON 7125-SV can be configured for roll stabilization. In roll stabilized mode, the sonar can operate in environments with up to +/- 10 degrees of roll without degrading system performance. Standard operating procedure on HSL 3101 and 3102 is to acquire data in the roll stabilized mode.

The user selectable range scale on the RESON 7125-SV was adjusted using the “autopilot” settings, or by hand.

Notable RESON7125-SV equipment changes:

Over the course of the season, three different TPUs were used between HSL 3101 and HSL 3102 as breakdowns and maintenance occurred. Additionally, a receiver cable failed and was replaced. No patch test was performed after any of these replacements, since the transducers were never removed from their mountings.

A.4 Variants of the Klein 5000 Side Scan Sonar

Klein System 5000

The KLEIN 5000 high-speed, high-resolution side-scan sonar (SSS) system is a beam-forming acoustic imagery device with an operating frequency of 455 kHz and vertical beam angle of 40°. The KLEIN 5000 system consists of a KLEIN 5500 towfish, a Transceiver/Processing Unit (TPU), and a computer for user interface. Stern-towed units also include a tow cable telemetry assembly. There are two configurations for data acquisition using the KLEIN 5000 system: stern-towed and hull-mounted. S-222 uses exclusively towed SSS, HSL 3101 is hull mount configuration, HSL 3102 can be converted from hull-mounted to towed as required. HSL 3102 operated using only the hull mounted configuration for the 2012 field season.

The KLEIN 5000 system is distinct from other commercially-available side scan sonars in that it forms 5 simultaneous, dynamically-focused receiver beams per transducer face. This improves along-track resolution to approximately 20cm at the 100m range scale, even when acquiring data at up to 10 knots. Across-track resolution is typically 7.5cm at the 100m range scale. The achievable 20cm resolution meets the NOAA Hydrographic Surveys Specifications and Deliverables Manual (HSSDM) for object detection. Digital data from the KLEIN 5000 TPU is sent directly to the acquisition computer for display and logging by KLEIN SonarPro software. Raw digital side scan data from the KLEIN 5000 is collected in (SDF) and maintained full resolution, with no conversion or down sampling techniques applied.

Towfish positioning is provided by CARIS HIPS using cable out values recorded in the Sonar Pro SDF files. This program uses Payout and Towfish Depth to compute towfish positions. The tow fish position is calculated from the position of the tow point using the cable out value received by SonarPro from the cable payout meter, the towfish pressure depth (sent via a serial interface from the KLEIN 5000 TPU to the SonarPro software), and the Course Made Good (CMG) of the vessel. This method assumes that the cable is in a straight line therefore no catenary algorithm is applied at the time of acquisition, but in processing, CARIS SIPS applies a 0.9 coefficient to account for the catenary.

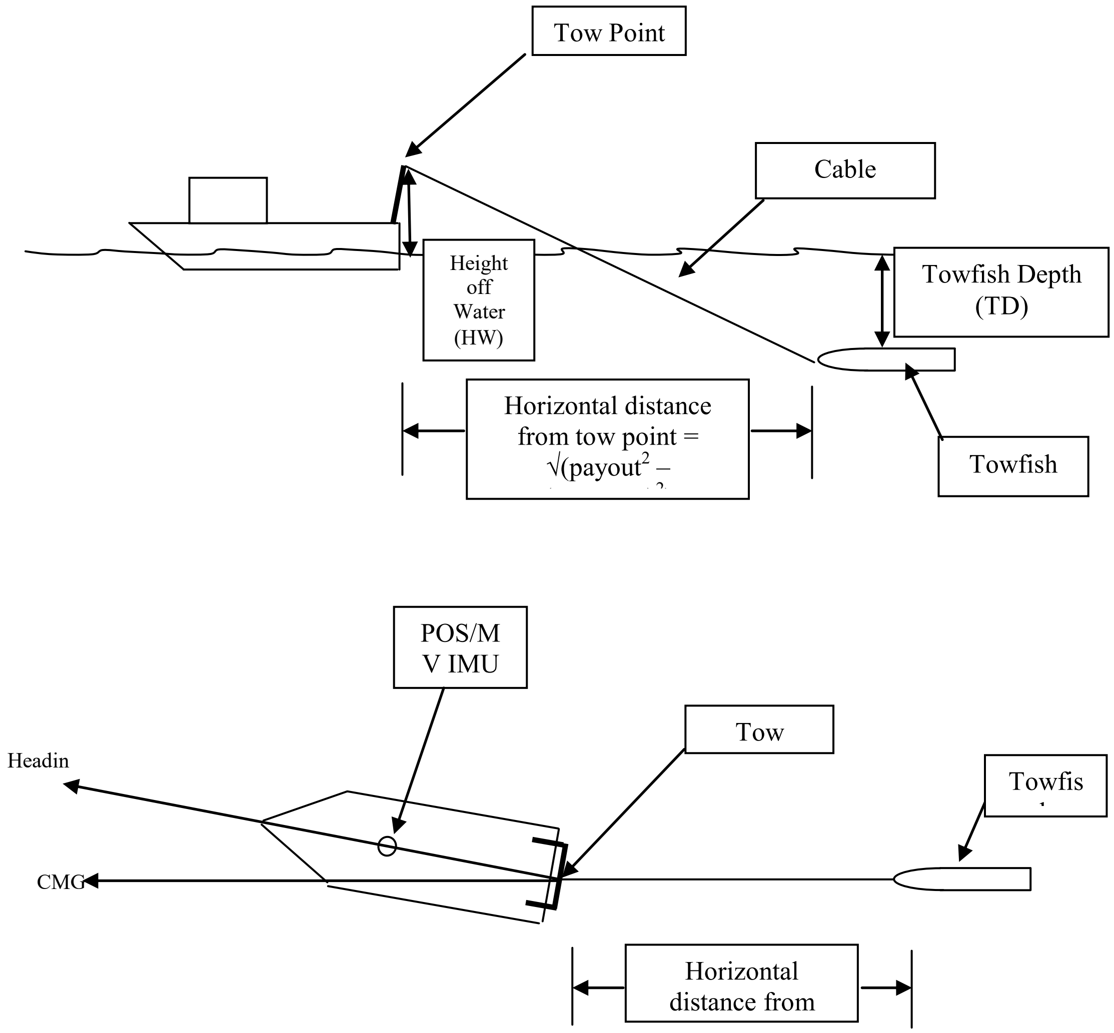


Figure A-6. Towfish orientation and position description.

When in the towed configuration, the north and east velocity vectors are filtered to calculate the ship's CMG. The CMG is used to determine the azimuth from the tow block to the side scan towfish. The position for the side scan towfish is computed based on the vessel's heading, the reference position (POS/MV IMU), the measured offsets (X, Y, and Z) to the tow point, height of the tow point above the water, Course Made Good and cable out. This calculated towfish position is sent to the sonar data collection system in the form of a GGA (NMEA-183, National Marine Electronics Association, Global Positioning System Fix Data String) message where it is merged with the sonar data file. Cable adjustments are made using a remote winch controller in acquisition in order to maintain acceptable towfish altitudes and sonar record quality. Changes to the amount of cable out are automatically saved to the SonarPro SDF.

Towfish altitude is maintained between 8% and 20% of the range scale in use (e.g. 4m-10m @ 50m range scale), when conditions permit. For equipment and personnel safety as well as safe vessel maneuverability, data may have been collected at towfish altitudes outside the 8% to 20% of the range over shoal areas and in the vicinity of charted obstructions or wrecks. When the towfish altitude was either greater than 20% or less than 8%, periodic confidence checks on linear features (e.g. trawl scars) or geological features (e.g. sand waves or sediment boundaries) were made to verify the quality of the sonar data. Confidence checks ensured the ability to detect one-meter high objects across the full sonar record range.

Another feature that affects the towfish altitude is the use of a K-wing depressor. The K-wing depressor is attached directly to the towfish and serves to keep it below the vessel wake, even in shallower near shore waters at slower survey speeds. The use of the K-wing reduces the amount of cable payout, which in turn reduces the positioning error of the towfish. Another benefit to less cable out is increased maneuverability of the ship in shallow water. Less cable out reduces the need to recover cable prior to turning for the next survey line, permitting tighter turns and increased survey efficiency.

Side scan data file names are changed automatically every 15 minutes and manually at the completion of a survey line.

Hull-Mounted Configuration

Aboard both survey launches, the lightweight or heavyweight Klein 5500 towfish can be mounted to an aluminum sled using omega brackets (Figure A-7). Positioning of the hull mounted towfish is determined by entering the X,Y, Z position of the towfish as the tow point and a layback value of zero. Otherwise, the system is processed the same as the towed configuration.

Figure A-7. Side Scan Hull Mounted on *3101 / 3102 (lightweight model shown).*

The hull-mounted configuration is normally used in depths of twenty meters or less, per the HSSDM. Aboard Launch *3101* and *3102*, sidescan may be collected concurrently with ODOM Echotrac CV-200 vertical beam bathymetry or RESON 7125 MBES.

Notable SSS equipment changes:

During the season, identical TPUs were swapped between platforms due to failures and platform acquisition requirements. The SSS fish data cable on HSL 3101 malfunctioned during the season and was replaced. Wet end hardware remained unchanged throughout these replacements.

A.5 Manual Sounding Equipment

No manual sounding equipment was used for this project.

A.6 Positioning and Orientation Equipment

Positioning for data acquired by the launches and the ship are achieved by writing differentially corrected GPS positions output from the POS/MV to the raw sonar data in real time. Upon conversion in CARIS, the positional information in the raw sonar data is used to create vessel track lines for the processed data. For projects OPR-B340-TJ-12 and OPR-B370-TJ-12, Ellipsoid Referenced Survey (ERS) methods were mandated.

When ERS are assigned, the additional positioning requirements involve logging full POSPac data from the POS/MV and utilizing POSPac MMS to derive Smoothed Best Estimate Trajectory (SBET) files. POSPac MMS requires ephemeris and clock data for the GPS constellation and data downloaded from Continually Operating Reference Stations (CORS) or other base stations to correct for atmospheric effects in the GPS data. SBET files are extremely accurate measurements of the 3-D position, speed, and motion of a vessel and can be used to apply higher quality navigation information to the processed data. Inertially Aided Post Processed Kinematic (IAPPK) navigation may be applied in CARIS during the SVP step in the processing workflow. For OPR-E350-TJ-12, OPR-B340-TJ-12, and OPR-B370-TJ-12, vertical and horizontal positioning was derived from IAPPK methods. IAPPK methods were not utilized for OPR-B363-TJ-12.

IAPPK methods are discussed in greater detail in Section C of this DAPR.

Applanix POS/MV

A basic requirement of multibeam hydrography is accurate ship's position and attitude data during data acquisition. *THOMAS JEFFERSON* uses inertial positioning and orientation sensors and U.S. Coast Guard Differential GPS (DGPS) for a highly accurate blended position and orientation solution. Surveys covered by this DAPR were acquired within approximately 50 nautical miles of USCG differential beacons. Because of this relatively short distance to the differential beacons, horizontal positioning errors of 0.5m were used in Caris HVFs for all platforms during the surveys covered by this DAPR.

THOMAS JEFFERSON, HSL 3101, and HSL 3102 are each equipped with Trimble DSM212L DGPS receivers. The DSM212L includes a 12-channel GPS receiver capable of receiving external RTCM correctors from a shore-based reference station. The DSM212L receivers are used for differential correctors to position only and not for actual positioning.

Inertial position calculations on *THOMAS JEFFERSON*, *HSL 3101, and HSL 3102* are provided by an Applanix POS/MV Model 320 v.4. During the winter period, all three POS/MV systems were sent to the manufacturer where they were upgraded to firmware version 5.0.3 and internal logging capability was added. At the beginning of the season, both internal and Ethernet logging of the .pos file was used to verify the quality of internal logging. Based on our analysis, the quality of internal logging met or exceeded that of Ethernet logging and Ethernet logging was discontinued.

The POS/MV 320 system includes dual GPS antennas, an inertial measurement unit (IMU), and data processor (PCS). The IMU measures linear and angular accelerations corresponding to the major motions of the vessel (heave, pitch, roll, yaw) and inputs this data to the PCS, where it is combined with a GPS position determined by carrier-phase differential measurements to give the final position solution. The POS/MV position solution is not sensitive to short period noise, but its accuracy may decay rapidly over time.

According to the manufacturer's specifications, the inertial position/orientation solution has typical values of 0.02° true roll and pitch accuracy, 0.02° heading accuracy, 2m position accuracy, and 0.03 m/s velocity accuracy. These parameters are monitored in real time during acquisition using the POS/MV user interface software. These values were entered into the HVF and were used to compute the TPU of each sounding.

All acquisition platforms are equipped with Precise Timing, a multibeam sonar acquisition configuration which synchronizes all data to the same time. The timing message is generated by the POS/MV which is received by both the acquisition computer and the RESON TPU. Precise Timing reduces the variable effects of time latency and creates a single, measurable latency (usually zero seconds +/- 0.005 seconds). This is verified during patch tests.

All platforms utilize True Heave (a long-period recording of vessel heave used to detect longer period sea swells that may not be detected during short-period heave calculations) for a post processed heave solution.

IMU's for *Thomas Jefferson, 3101,* and *3102* were all sent to the manufacturer during the winter inport 2009-2010 for tumble testing and calibration. All IMUs passed tumble testing and calibration.

A.7 Sound Velocity Profilers

A Brooke Ocean Technology Moving Vessel Profiler (MVP) with an Applied Microsystems Smart Sound Velocity and Pressure (SV&P) sensor or a Seabird Electronics SBE-19 CTD were used to collect sound speed profile (SSP) data from *Thomas Jefferson*. Seabird Electronics SBE-19 CTD+ units were used to collect sound speed profile (SSP) data from Launches 3101 and 3102. SSP data were obtained at intervals frequent enough to reduce sound speed errors. The frequency of casts is based on observed sound speed changes from previously collected profiles and time elapsed since the previous cast. Subsequent casts were made based on the observed trend of sound speed changes. As the sound speed profiles change, cast frequency and location are modified accordingly. Confidence checks of the sound speed profile casts are conducted weekly by comparing simultaneous casts taken with all sound speed determining devices on the ship and each launch.

Sound speed data are included with the survey data in Section II of the Separates for each survey's Descriptive Report. Uncertainty values for sound speed are input into Caris by survey day for each platform during the TPU process. When CTDs are used, uncertainty values of 1m/s for each hour between successive casts is recommended to determine an appropriate uncertainty value. However, to be conservative, all CTD derived sound speeds are assigned an uncertainty of 4m/s even when acquired more frequently than every 4 hrs. An uncertainty value of 1m/s is used for all MVP casts even though MVP casts rarely exceed 1 hour between successive casts. Additionally, a surface sound speed uncertainty value of 0.2m is used for launches 3101 and 3102, as recommended in the 2012 FPM.

Sea-Bird SBE19/19+ CTD Profilers

THOMAS JEFFERSON and Survey Launches 3101 and 3102 acquire water column sound velocity data using Sea-Bird Electronics SeaCat SBE19 and SBE19+ Conductivity-Temperature-Depth (CTD) profilers. Temperature is measured directly. Salinity is calculated from measured electrical conductivity. Depth is calculated from strain gauge pressure.

THOMAS JEFFERSON is equipped with a SeaCat SBE19 CTD profiler with strain gauge pressure sensor. The SBE19 is capable of CTD profiling at depths from 0-3400m. Post calibration drift is expected to be 0.02 °C yr^{-1}, 0.012S m^{-1} yr^{-1}, and 4.5 psia yr^{-1} for temperature, conductivity, and pressure, respectively. The SBE19 is deployed by hand or using the DT Marine Oceanographic winch for ship based acquisition.

HSL 3101 and HSL 3102 are each equipped with a SeaCat SBE19+ CTD profiler with strain gauge pressure sensor. The SBE19+ has a specified post-calibration temperature accuracy of 0.0005S m^{-1}, and strain-gauge pressure accuracy of 0.35 psia. Post calibration drift is expected to be 0.002 °C yr^{-1}, 0.004S m^{-1} yr^{-1}, and 0.168 psia yr^{-1} for temperature, conductivity, and pressure, respectively. The SBE19+ is capable of CTD profiling at depths from 0-350m. The SBE19+ is deployed by hand from HSL 3101 and 3102.

All CTD instruments were returned to the manufacturer for calibration during December, 2011.

Sea Surface Sound Velocimeters

Unlike CTD profilers, surface sound velocimeter sensors (SSVS) calculate sound velocity in water using two-way travel time. The typical SSVS consists of a transducer and a reflector at a known distance from the transducer. A pulse of known frequency is emitted, reflects at the reflector surface a known distance from the transducer, and returns. The two-way travel time is measured, and sound velocity is derived. SSVS are required for multibeam systems that perform active beam steering at the transducer head. The RESON 7125 and RESON 7125-SV systems both require SSVS data.

The AML Smart SV&T Probe is a real-time time-of-flight sound velocimeter and thermistor sensor. The manufacturer specified sound velocity accuracy is 0.02 m/s and temperature accuracy is 0.03 °C. Empirical observations of drift show a sound velocity drift of approximately 0.5 m/s/yr and temperature drift of approximately 0.05 °C/yr. Aboard *THOMAS JEFFERSON*, the AML Smart SV&T probe is mounted in an insulated sea chest in the sonar void. Sea surface temperature and sound velocity values are output in real time to the SIMRAD EM1002 and RESON 7125 systems at a rate of 10 Hz and are recorded in the raw Hypack .hsx files.

The surface sound speed uncertainty for the ship is based on historical analysis and the same values were used throughout the season. More details may be found in Section C of this DAPR.

RESON Sound Velocity Probe 71 (SVP)

The RESON SVP 71 is a real-time surface sound velocimeter. The manufacturer specified sound velocity accuracy is ±0.15 m/s at 0 – 50m. Surface sound velocity values are output to the RESON 7125-SV system at a rate of 20 Hz and lower. Data can be sent in real time to the RESON 7125-SV processor unit and are recorded in the raw Hypack .hsx files.

RESON SVP 71 was installed at the beginning of the 2011 field season on Launches *3101* and *3102*.

ODOM Hydrographic Systems Digibar Pro

The Digibar Pro is a real-time time-of-flight sea surface sound velocimeter. The manufacturer specified sound velocity accuracy is 0.3 m/s. Sea surface temperature and sound velocity values are output to the RESON 7125-SV system at a rate of 10 Hz. Data can be sent in real time to the RESON 7125-SV processor unit

The units were returned to the manufacturer and calibrated during the 2009-2010 inport period.

The Odom Digibar Pro is kept onboard Thomas Jefferson as a ready spare and was not utilized for any surveys covered by this DAPR.

Brooke Ocean Technology Moving Vessel Profiler 100

The Moving Vessel Profiler (MVP) (figure A-8) is a self-contained profiling system capable of sampling water column profiles to 100m depth. MVP-100 was mounted to the port quarter. The MVP consists of a computer-controlled high speed hydraulic winch, a cable metering, over-boarding and docking system, a conductor cable and a streamlined free fall fish (FFF) housing an Applied Microsystems "time of flight" SV&P Smart Sensor (see SV&P below) . The system as configured aboard the *THOMAS JEFFERSON* collects vertical profiles of sound velocity data while the ship is underway at survey speed. The unit is located on the fantail and controlled remotely from the ship's acquisition room. When using MVP casts in conjunction with the RESON 7125 MBES, sound velocity data is processed using Pydro Velocipy software, then applied in CARIS HIPS during post processing.

Figure A-8. MVP 100 on S-222

Notable equipment changes: None

AML – Sound Velocity & Pressure Smart Sensor (SV&P)

The SV&P Smart Sensor is the main instrument housed on the MVP free fall fish; it is designed to directly measure sound velocity and pressure in water. Its small size, extremely fast response time and high sampling rate make the sensor ideal for fast profiles or tow speeds. The sensor has internal calibration coefficients and outputs real-time data to allow a "plug and play" environment.

The Applied Microsystems Smart SV&P Sensor was last calibrated by the manufacturer during December 2011.

A.8 Bottom Samplers

Two types of bottom samplers are used aboard *THOMAS JEFFERSON* for analyzing bottom sediments.

The Khalisco Mud Snapper model 214WA100 may be deployed by one person by hand and is best used for shallow-water bottom samples acquired on the survey launches. (Figure A-9)

The Ponar Wildco model # 1728 sampler may be deployed by one person by hand and is sometimes used with the DT Marine Oceanographic winch for Ship based bottom sample acquisition. (Figure A-10)

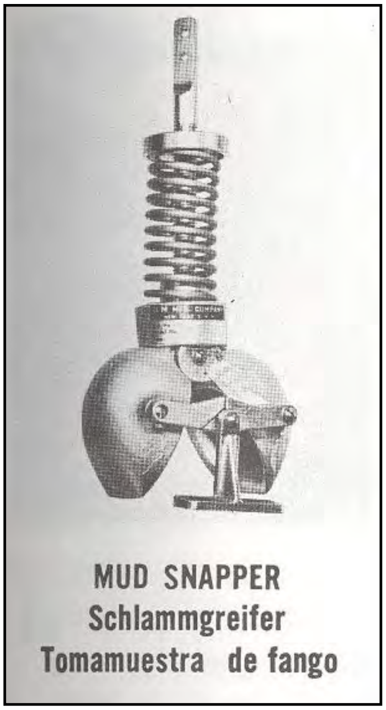


Figure A-9. Khalisco Mud Snapper

Figure A-10. Ponar Grab Sampler

A.9 Software Systems

Acquisition Software

Multibeam data were acquired using Hypack 2012 software running on acquisition computers with the Windows XP and Windows 7 operating system. Hypack is used to control real-time navigation, data time–tagging, and data logging. KLEIN 5000 side scan sonar data were acquired using KLEIN's SonarPro software running on acquisition computers with the Windows XP and Windows 7 operating system. Moving Vessel Profiler data were acquired using Brooke Ocean Technology MVP software running on a computer with the Windows XP operating system.

Data Processing: Post-acquisition multibeam processing was performed on board the *Thomas Jefferson* using processing computers with Windows XP and Windows 7 operating systems, which run CARIS HIPS&SIPS software. Side scan sonar data were reviewed for targets, side scan mosaics and contact generation in CARIS HIPS&SIPS software; Side-scan contacts were correlated with multibeam data in NOAA's Pydro software. CTD and MVP data were processed using NOAA Velocipy software. See Table A-5 below for software versions.

NOAA Ship Thomas Jefferson - Acquisition and Processing Software

Acquisition Software	Date of Application	TJ	3101	3102
Hypack/Hysweep	Apr-12	v2012	v2012	v2012
SonarPro	Feb-10	v11.2	v11.2	v11.2
Velocipy	Oct-12	V12.9	V12.9	v12.9
Applanix MV POSView	Apr-12	v5.1.0.2	v5.1.0.2	v5.1.0.2
TSIP Talker	Aug-10	v2.00	v2.00	v2.00
MVP	Sep-09	v.2.351		

Processing Software	Date of Application	Version
CARIS Hips and Sips	Sept-2012	7.1, SP2, HF 3
CARIS Bathy Database	Oct-2012	4.0
Windows 7 Pro 64-bit	Oct-2012	SP1
Pydro	Oct-2012	12.9 r3191

Table A-5 – Acquisition and Processing Software versions and dates of application

CARIS HIPS AND SIPS Version 7.1 SP2, HF3

CARIS HIPS (Hydrographic Information Processing System) is used for all initial processing of multibeam and vertical beam echosounder bathymetry data, including tide, sound velocity, and vessel offset correction and data cleaning. CARIS HIPS uses statistical modeling to create Bathymetry with Associated Statistical Error (BASE) surfaces in one of three ways: swath-angle weighted grids, uncertainty-weighted grids, and Combined Uncertainty and Bathymetry Estimator (CUBE) algorithm grids. Creation of grids as bathymetric products is discussed in section B of this report.

CARIS SIPS (Side-scan Information Processing System) is used for all processing of side-scan sonar imagery, including cable layback correction, slant range correction, contact selection, towpoint entry, and mosaic generation.

HSTP PYDRO Version 12.9

HSTP PYDRO is a program for the correlation and classification of side-scan sonar and multibeam bathymetry features and for the creation of preliminary smooth sheets. Multibeam features (designated soundings), side-scan sonar contacts, and detached positions are analyzed, grouped, and assigned S-57 classifications. High resolution BASE surface data is entered into the program and excessed to survey scale. The final product is a Preliminary Smooth Sheet file (PSS), which is delivered to the Atlantic Hydrographic Branch as part of the final submission package.

Pydro Versions 7.3 and later have functionality for TCARI installed. TCARI is described in detail in section C.2.1. The TCARI file for the area (when applicable) is received from NOS and loaded into Pydro along with the predicted, observed, or verified tide files for the corresponding stations. The use of TCARI is specified in the Project Instructions.

Pydro is also used for chart comparisons, generation of chartlets, generation of Danger to Navigation reports, generation of appendices to the Descriptive Report, compilation of survey statistics, and generation of standard NOAA forms such as the Descriptive Report cover sheet.

HSTP VELOCIPY

HSTP Velocipy is a program for the processing of sound velocity casts from Seabird CTDs and Moving Vessel Profiler systems. This program converts hexadecimal SeaCat data into ASCII conductivity-temperature-depth data, and then converts the ASCII data into a depth-binned sound velocity file that is compatible with CARIS HIPS/SIPS. Velocipy allows for batch processing of the numerous .calc files generated by the MVP during multibeam echosounder acquisition. The resulting .svp files are applied in CARIS HIPS during post-processing to correct for sound velocity variation within the water column. Velocipy is also used to check the accuracy of sound velocity casts and to archive sound velocity information for the National Oceanographic Data Center.

CARIS Base Editor 4.0

Base Editor is used for feature and AWOIS planning, feature de-conflicting, surface and sounding review, and chart comparison. This software is useful for visually analyzing a variety of data formats throughout each stage of the survey. Additionally, this software is used during survey content review meetings as one of the final data checks before surveys are submitted to the processing branch. During the 2012 season, most surveys primarily used Base Editor for feature management as opposed to Pydro.

B. QUALITY CONTROL

B.1 Acquisition Procedures

All platforms acquire hydrographic data according to the Project Instructions for each survey. The Project Instructions for a given survey specify the acquisition method to be used, the coverage required, and give the field unit discretion as to the best method to achieve that coverage.

The following survey types are used during field operations by *THOMAS JEFFERSON* in the 2012 Field Season:

- Complete MBES Coverage
- Object Detection SSS Coverage
- Object Detection MBES Coverage
- Concurrent Set Line Spacing MBES With Object Detection SSS
- Concurrent Set Line Spacing VBES With Object Detection SSS.

These coverage types are described in detail in the April 2012 Hydrographic Survey Specifications and Deliverables.

Line plans are designed by the field unit according to the coverage type specified in the Project Instructions. For complete coverage MBES surveys, lines are planned to acquire sufficient overlap to allow for a reasonable level of vessel deviation. Alternatively, MBES acquisition can be planned using a real time coverage matrix and polygon areas to achieve full bottom coverage. Line spacing for 100% SSS acquisition is established by multiplying the desired range scale, in meteres, by 1.6. For 200% SSS acquisition, line spacing is set to range scale multiplied by 0.8. Line planning and coverage type are discussed in detail in the Descriptive Report for each survey.

Crosslines are acquired as an additional confidence check for bathymetry. Crosslines provide a meaningful comparison between nadir beams and outer beams of mainscheme acquisition lines in the case of multibeam, and nadir to nadir for vertical beam lines. Crosslines are compared to the mainscheme lines using the standard deviation layer and hypothesis count layer of the grids in CARIS HIPS and Base Editor.

Acquisition speeds are adjusted to balance data quality, productivity, and energy efficiency. The Thomas Jefferson's bathymetric sonars typically produce densities above that which is required in Specs and Deliverables for "skunk striped" and complete coverage surveys at all survey speeds.

B.2 Quality Management

A systematic approach to Quality Management has been instituted aboard the *THOMAS JEFFERSON*, starting well before the field season begins, through to the final packaging of Survey Deliverables and delivery to AHB.

Clear and concise communication is critical at all stages of the survey, and is established between all relevant parties[1] at the earliest stage of the process. Figure 1 represents the parties involved at all stages of the Quality Management process.

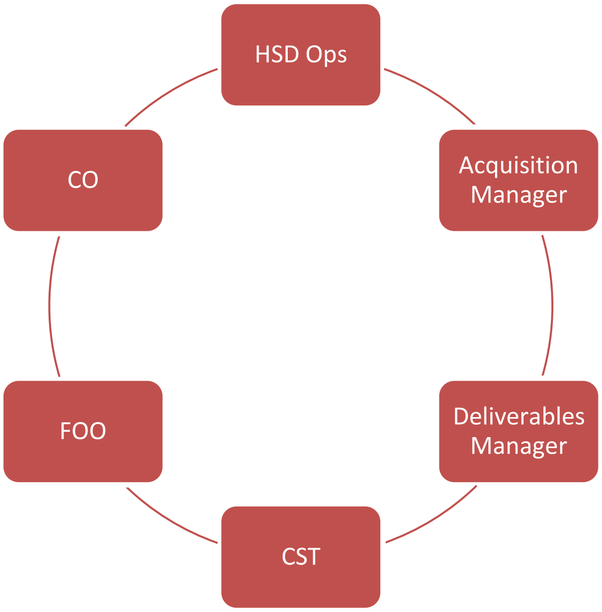


Figure B-1: Quality management loop

[1] Note on Personnel:
CO – Commanding Officer, FOO – Field Operations Officer, CST – Chief Survey Technician, HSD OPS – Hydrographic Surveys Division, Operations Branch

Below is a graphic showing the Quality review steps used aboard the *Thomas Jefferson*.

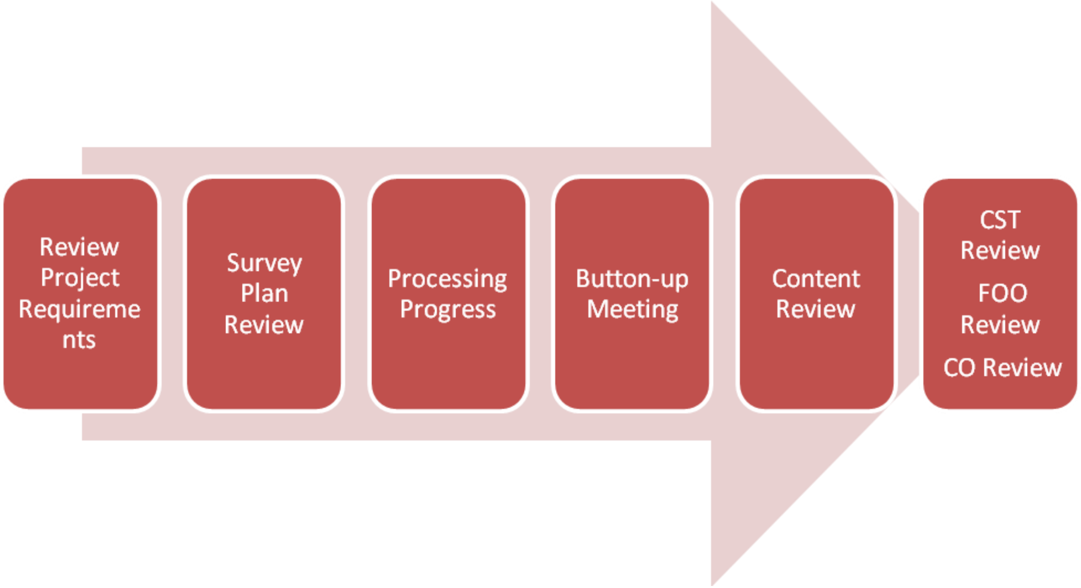


Figure B-2: Quality Review Stages

In the Review Project Requirements stage, the final project instructions are reviewed for specific criteria. Some of these are:

- Is the Survey fit for the Purpose?
- Are all charted features and AWOIS in the Composite Source File (CSF)?
- Are there any extraneous or unassigned features in CSF?
- Is the Survey a reasonable size?
- Are the resources available for the job?
- Do we have the right equipment, spares, qualified staff, OT, software and specs?
- Are there any special requirements from HSD OPS?

If any of these elements are found to be in question, dialogue is opened with HSD OPS, in order to resolve them. Once these questions have been answered, the Acquisition manager can prepare the survey plan. This would include the following requirements:

- Line plans/Polygons, Crossline plans, Bottom Sample plan
- Feature requirements as addressed in the Composite Source File (CSF) or ENC.
- Safety of Operations, i.e. where we can and cannot go.
- The plan's effectiveness and efficiency.
- Proper or maximum platform utilization.
- Survey Specific Sensor configurations, staffing plans, line plans, target files, etc.

All aspects of the survey plan are carefully reviewed by the CST, FOO and CO for any required changes initiated by the Acquisition manager before survey begins.

A weekly progress review of all planned and open surveys is conducted to evaluate and incorporate the following factors into the acquisition and deliverables schedule:

- Ship schedule (inports/transits)
- Completion rate, estimated survey end date
- Weather factors
- Equipment failures
- Processing backlog (if any)

The goal is to continuously manage multiple surveys and to establish a projected survey shipment date which accurately reflects all known factors. If processing is not keeping pace with acquisition, then additional resources can be deployed to reduce backlogs. This in turn allows for better quality assessment of collected data.

A Progress review of the survey occurs shortly before completion, with the following goals:

- Review remaining work
- Evaluate density coverage (5 Pings per grid node?)
- Confirm that all assigned features have coverage
- Prioritize remaining work for time remaining
- Adjust personnel and platform schedules as necessary
- Evaluate grids for systematic errors (Std Dev, Uncertainty)
- Review initial field sheet layout

After acquisition is complete and the Deliverables manager has applied final tides to all data, a Content Review is performed on the initial results of the survey, primarily surfaces and feature reports. Some of the particular items addressed are:

- Systematic errors evident in the child layers of the grids (Density, Std Dev, Hypothesis Count) that need to be addressed in the DR.
- Review feature report and advise changes or revisions.
- Consider any feature candidates for DtoN's.
- Determine any unusual acquisition or processing issues that need to be discussed in DR.

The final stage of the Quality Management system is a multiple review of the deliverables, by the CST, FOO and CO, each ensuring that all Specs have been met and that any revisions or changes identified in the Content Review have been made. These checks include:

- Examine finalized/thresholded grids for flyers or unresolved systematic issues. Are they discussed in the DR?
- Final check of feature report inclusions, relevance, S-57 attribution, image quality and general completeness.
- Vetting of the final DR. Does it reflect the Content Review discussion?

- Housekeeping – are all the ancillary reports, documents and data included and in the proper place?

B.3 Data Management

A daily tracking of data has been developed to maintain data quality and integrity. Several forms identify and track the flow of data as it is collected and processed. These forms are presented in the Separates section under data acquisition and processing logs, included with the data for each survey.

During data collection, watch standers continuously monitor acquisition systems, checking for errors and alarms. Thresholds set in Hypack/Hysweep, POSPAC, RESON and SonarPro alert the watch stander by displaying alarm messages when error thresholds or tolerances are exceeded. These alarms, displayed as they occur, are reviewed and acknowledged on a case-by-case basis. Alarm conditions that may compromise survey data quality are corrected and then noted in acquisition log. Warning messages such as the temporary loss of differential GPS, excessive cross track error, or vessel speed approaching the maximum allowable survey speed are addressed by the watch stander and corrected before further data acquisition occurs.

Following data acquisition, initial processing begins. See figure B.3 for an example of the typical multibeam data processing procedures. The following checks are performed to insure proper data handling throughout the process:

- A one to one comparison of raw data to acquisition logs is performed.
- Correctors, including tide files, true heave, and SVP files are checked for completeness and accuracy.
- Application of all correctors is tracked by line and by application.

Figure B.3 shows the general processing flow for Multibeam data after collection.

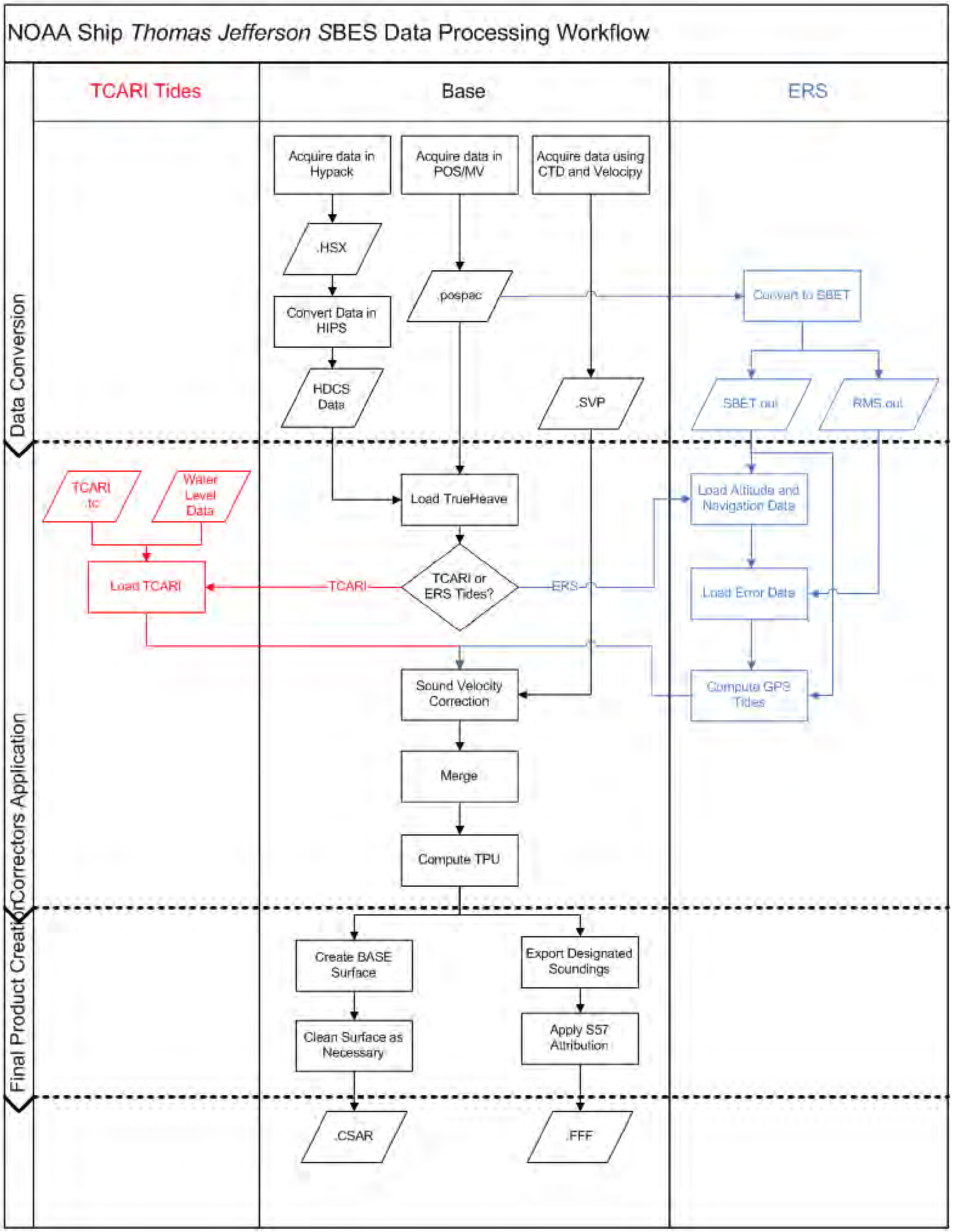


Figure B-3: Data processing flow

BASE surfaces are generated to ensure adequate data density, identify areas of high standard deviation and note any obvious problems with correctors.

Results of the processing are reviewed to determine adequacy of data and sounding correctors. Additional processing in preparation of data deliverables includes the following steps:

- Generation of side scan Contact Files and a Contact Plot
- Subset editing and review of multibeam data
- Application of verified tide correctors to multibeam data
- Application of true heave
- Cross line analysis of MBES data
- Cross line time series comparison between TCARI/Zone tides and ERS.
- Comparison with prior surveys
- Generation of shoal biased selected soundings at the scale of the survey
- Comparison with existing charts
- Quality control reviews of side scan data and contacts
- Final Coverage mosaic plots of side scan sonar data
- Correlation of side scan contacts with multibeam data
- Final quality control of all delivered data products

Processing and quality control procedures for multibeam and side scan data acquisition are described in detail below.

B.4 Bathymetry

Raw bathymetry data, (Hypack .hsx) are converted into CARIS HDCS data format upon completion of daily acquisition. Conversion parameters vary for each data format, and are stored in the LogFile of each HDCS processed line folder. After data conversion, attitude, and navigation are reviewed for outliers, and true heave, water level, and sound velocity are applied. Bathymetry lines are then merged. Following merge, Total Propagated Uncertainty (TPU) is calculated for each sounding. For a more detailed explanation of TPU calculation of multibeam and vertical beam echosounder data, refer to Section 4.2 of the 2012 NOAA Field Procedures Manuals.

Depending on acquisition type, MBES bathymetry may be processed using either an uncertainty-weighted navigation surface or a CUBE surface. Uncertainty-weighted BASE surfaces and CUBE surfaces are described in detail in the 2012 NOS Field Procedures Manual and the CARIS HIPS/SIPS Users Manual.

When the primary source of bathymetry for a survey area is a combination of VBES and MBES, a collection of finalized uncertainty-weighted mean bathymetric surfaces is generated as the product of the survey. CUBE is not permitted for this type of survey. When the primary source of bathymetry for this type of survey is set line spacing MBES data (also known as “skunk striped”), CUBE shall be used. The use of CUBE in this situation is required to guarantee proper nodal propagation distances as described in section 5.2.1, Gridded Data Specifications, of the 2012 HSSD. In most instances 95% of the nodes in a CUBE grid must contain a minimum of 5 soundings/node to adequately represent the seafloor depth in a given area.

When Complete or Object Detection (OD) MB is the primary source of bathymetry, data are processed using CUBE grids. The use of CUBE is mandatory to ensure compliance with the specification described in the paragraph above. Table 1 shows the required resolution in various survey depths.

Object Detection Coverage

Depth Range (m)	**Resolution (m)**
0-20	0.5
18-40	2

(Object Detection is rarely needed in depths greater than 30 meters).

Complete Multibeam Coverage

Depth Range (m)	**Resolution (m)**
0-20	1
18-40	2
35-80	4
75-160	8

Table B-1. Multibeam resolution requirements by depth and coverage type

Each resolution has its own CUBE parameter settings, and the hydrographer uses the appropriate resolution based CUBE parameters settings when computing each grid. CUBE parameters were distributed with the project instructions for each survey. CUBE parameters can be found in the 2012 Field Procedures Manual, Appendix 4.

B.5 Error Modeling in CARIS HIPS

CARIS computes TPU based on both the static and dynamic measurements of the vessel and survey-specific information including tidal zoning uncertainty estimates and sound speed measurement uncertainties. Offset values are entered into the CARIS *.hvf file. During processing, the tidal zoning and speed of sound measurement errors are applied. Where TCARI tides are used, uncertainty is calculated and applied during application of TCARI tidal correctors to HDCS data.

Tidal Uncertainty
-For surveys in project B363, tidal zoning was used and an uncertainty value of 0.102 meters was applied.
-For surveys in project E350, TCARI tides were used and no uncertainty value was applied manually during processing.
-For surveys in projects B340 and B370, Vdatum was used and an uncertainty value of 0.102 meters was applied.

For most surveys, tidal zoning values are provided with the Water Level Instructions, TPU parameters for tidal uncertainty are listed in each survey's Descriptive Report.

Sound Speed Uncertainty

TPU Parameters for sound speed uncertainties are documented in each survey's Descriptive Report.

Additional Uncertainties

Instrument-specific uncertainty values are obtained from either the CARIS TPU resource website or per HSD guidance. These uncertainty values are recorded in the Hips Vessel File (.hvf) for each vessel and sonar configuration. .hvf files used during the 2012 field season are included with as an attachment to this document in Appendix B.

B.6 Bathymetry Analysis and Feature Classification

Least depths of navigationally significant features are flagged as "designated soundings," which both identifies the object as a navigationally significant object for import into Pydro and forces the depth of the grid to match the least depth of the feature.

Following data cleaning in CARIS HIPS, Designated soundings and Side Scan contacts are inserted into a PYDRO Preliminary Smooth Sheet (PSS). DP and GP features are inserted using the "Generic Data Parser" tool. Images of contacts exported from CARIS are displayed in the Image Notebook Editor in PYDRO. Contacts are arranged by day and line and can be selected in the data "Tree" window. Information concerning a specific contact is reviewed in the Editor Notebook Window in PYDRO. This information includes contact positions; AWOIS item positions, contact cross references, and charting recommendations.

Contacts are classified according to type of contact (e.g. MBES, SSS, DP, etc), confidence, and proximity to other contacts. Although this will vary from survey to survey, the following general rules apply for classification of contacts:

- MBES contacts will be classified as primary contacts over SSS, DP, and GP contacts;
- If there are two or more MBES contacts for the same feature, the MBES contact of least depth is classified as the primary contact;
- If there is no bathymetry contact for a feature, then the SSS position will be classified as primary contact over DP and GP contacts;
- If there are two or more SSS contacts for the same feature, then the SSS contact that best represents the feature is classified as the primary contact;
- If there are no bathymetry or imagery contacts, then the DP contact that best represents the feature is classified as the primary contact.

Multiple representations of one distinct feature (e.g. contacts from two or more SSS lines on a known wreck) may be grouped. For a group of features, one representation is selected as the primary contact, and all others are selected as secondary contacts with respect to the primary contact.

Significant features are defined by the Hydrographic Survey Specifications and Deliverables as an object rising more than 1m above the seafloor in water depths of 0-20m, and an object rising 10% of depth above the seafloor in water depths greater than 20m. Either echosounder least depth or side-scan sonar acoustic shadow height may be used to determine height of an object off the water bottom.

Contacts appearing significant are further investigated with a MBES system capable of meeting NOAA object detection specifications. If there is no known least depth of good confidence on a significant feature, then the feature will be flagged as "Investigate." Features with such a tag must be further developed, in order of preference, with multibeam echosounder, diver least depth gauge, or vertical beam echosounder.

Any items that are to be addressed in the Feature Report (Appendix II) of the Descriptive Report are flagged as "Report". Examples of Report items include position of new or repositioned Aids to Navigation, permanent man-made features which do not pose a danger to surface navigation, or dynamic sedimentary bed forms which have not been previously noted on the chart. Items which have the "Report" flag set could also be further designated for inclusion in the Danger to Navigation Report by choosing the "DTON" flag. Dangers to Navigation are submitted to the Commanding Officer for review prior to submission to the Marine Charting Division (MCD).

After a feature is fully classified, primary features are flagged as "Resolved." If a primary feature is flagged "Resolved," then the secondary features correlated to that primary feature are automatically flagged "Resolved" and are given the same full classification as the primary feature.

CARIS BathyDataBase

For the 2012 field season, a new feature management procedure was implemented. This new procedure used BathyDataBase for all feature attribution, de-conflicting and reporting. Pydro was still used as an intermediary to extract designated soundings from bathymetry line data and place them in to a .000 file to be accessed from BathyDataBase.

B.7 Imagery

Side scan sonar data are converted from *.sdf (Sonarpro raw format) to CARIS HDCS. Processing side scan data includes examining and editing fish height, vessel heading (gyro), and vessel navigation records. When side scan sonar is towed, fish navigation is recalculated using CARIS SIPS. Tow point offsets (C-frame and cable out), fish depth, fish attitude, and water depth are used to calculate horizontal layback.

After towfish navigation is recalculated, side scan imagery data are slant-range corrected to 0.1m with beam pattern correction. The slant-range corrected side scan imagery data are closely examined for any targets. Targets-of-interest are evaluated as potential contacts based upon apparent shadow height and appearance, particularly targets which do not appear to be natural in origin. Contacts are selected and saved to a contact file for each line of SSS data. Contact selection includes measuring apparent height and width, selecting contact position, and creating a contact snapshot (*.tif) image.

Side scan sonar coverage is determined by creating mosaics using Mosaic Editor in CARIS SIPS. Mosaic Editor uses the accurately modeled backscatter correction algorithms of the Geocoder engine to process source data. This processed imagery data is stored in SIPS as Georeferenced Backscatter Rasters, or GeoBaRs. GeoBaRs are the basis for all mosaics created in SIPS. From the GeoBaRs, mosaics are created which can be examined and edited in Mosaic Editor. Once imagery has been corrected, a full mosaic can be compiled from the data. If any deficiencies in the side scan sonar data are found, a holiday line file is created from the mosaics and additional lines of SSS are acquired.

B.8 Survey Deliverables and Ancillary Product Generation

The ship's final bathymetric deliverables to the Atlantic Hydrographic Branch are a collection of BASE surfaces, the final feature file (FFF) .000, including S-57 feature classifications, the Descriptive Report, and side scan sonar mosaics (when applicable). The resolution of surfaces varies according to acquisition type specified in the Project Instructions.

C. Corrections to Echo Soundings

C.1 Sound Velocity

Sound speed data acquired by the surface sound velocity sensors on *THOMAS JEFFERSON* and *HSL 3101/3102* are recorded in the raw Hypack .hsx files and are used to calculate transmit and receive angles for the ray tracing algorithm. The surface sound velocity sensors are discussed in Section A and will not be discussed further in this section.

CTD Profiles

Sound velocity profiles for the *THOMAS JEFFERSON* and for Launches *3101* and *3102* are processed using the program HSTP Velocipy version 12.9 which generates sound velocity profiles for CARIS HIPS. Sound velocity correctors are applied to MBES and VBES soundings in CARIS HIPS during post processing only.

The speed of sound through water is determined by a minimum of one cast per week (although one per day is usually acquired) for VBES acquisition and one cast every three to four hours of MBES acquisition, in accordance with the NOS Hydrographic Surveys Specifications and Deliverables (HSSD). Casts are conducted more frequently when changing survey areas, or when environmental conditions such as changes in weather, tide, current, or significant spatial and/or temporal variation in the speed of sound is observed in the survey area that would warrant additional sound velocity profiles.

The sound velocity casts are extended automatically and applied to all bathymetric data in CARIS HIPS during post processing.

Brooke Ocean MVP

The SV data acquired by the MVP is transmitted to a raw SV file folder, where the hydrographer conducts a basic check of the data for correct day number, sound velocity data, and file format/integrity. The SV cast may also be graphically viewed and compared with other casts using the Sound Velocity vs. Depth graph in the MVP controller software.

Like CTD casts, MVP casts are processed and/or extended for use in CARIS HIPS using HSTP Velocipy.

C.2 Water Level Correctors

Zoned Tides

Soundings are initially reduced to Mean Lower-Low Water (MLLW) using preliminary (observed) water level data. Data may be obtained from the primary tide gauge through the Center for Operational Oceanographic Products and Services (CO-OPS) website. Observed water level files are converted to CARIS tide files (.tid) and/or text files and applied to all sounding data using either discrete tide zoning in CARIS HIPS or the TCARI module in Pydro. The type of water level correction used in a survey is specified in the Water Level Instructions, provided by CO-OPS.

When discrete tide zoning is specified in the Tide Note, THOMAS JEFFERSON personnel use verified water levels and final tide zoning from the Zone Definition File (ZDF) provided by CO-OPS for hydrographic product generation.

TCARI

Tidal Constituents and Residuals Interpolator (TCARI) grid files, when applicable, are submitted to THOMAS JEFFERSON as part of the Project Instruction package. A TCARI grid is computed using the shoreline, a limiting boundary, and the positions of two or more water level gauges. Harmonic constants, residual water levels, and gauge weights are interpolated for each grid point, using the data from the water level gauges as control points. Water level corrections are applied in Pydro using the TCARI tools found in Pydro. When using TCARI for datum reduction, water level corrections are not applied to echosounder data in CARIS. Following TCARI water level correction in Pydro, data is merged and processed as described in Section B.

Ellipsoid Referenced Surveys and VDATUM

ERS methods were required for all surveys in projects B340 and B370. For these surveys, processed SBETs, as described in Section A of this DAPR, are applied in CARIS Hips and Sips. First, the smoothed attitude and navigation are loaded by using the “Process-Load Attitude/Navigation data” option. Next, the error data is loaded by using the “Process-Load Error data” option. Once these steps have been completed successfully, the TPU must be recomputed and “Error Data” must be checked instead of “Vessel Settings”. Following TPU computations, GPS Tide must be computed. This is accomplished by selecting the “Process-Compute GPS Tide” option and loading the .csv separation model. This separation model is either included with the project instructions, or generated by the field unit by utilizing the VDATUM tool built into Pydro. Once created, the .csv file contains a node by node offset between the ellipsoid and MLLW. If no model is applied, and the height offset is left at 0.0, then all soundings remain referenced to the ellipsoid. However, since the current guidance from the Office of Coast Survey is to reduce all soundings to MLLW, a .csv model shall be used when computing GPS Tide. The final step is to Merge the data and apply the GPS Tide computed in the previous step.

C.3 Multibeam Calibration Procedures

Heave, pitch, roll, yaw, and navigation latency biases for each vessel are corrected during a multibeam bias calibration test (patch test). MBES vessel offsets, dynamic draft correctors, and system bias values are contained in HIPS Vessel Files (HVFs). These offsets and biases are applied to the sounding data during processing in CARIS HIPS. A Patch Test or verification of certain biases is typically performed at the start of each field season and re-verified for each project before acquiring MBES data in the new survey area. Calibration reports are generated for initial calibrations at the beginning of the field season, but reports are not necessarily generated for each project when values are re-verified. Small changes in the roll bias are common, but also are not necessarily documented by official reports. Changes in .HVFs not accompanied by full calibration reports are instead documented in the comments column of the HVF entry by the date in which the change took effect. HVF files are submitted with this document under Appendix B.

C.4 Vessel Offsets, Static Draft, and Dynamic Draft Correctors

A partial re-survey of *THOMAS JEFFERSON* vessel offsets was conducted on 10 March 2005 by NGS personnel, and no physical changes in offsets have occurred since then.

Coordinate (direction)	NGS Values
X (fore and aft)	-10.282
Y (port and starboard)	1.356
Z (vertical)	-22.320

Table C-1. IMU to Primary GPS antenna offsets for *Thomas Jefferson*

Preliminary static draft measurements are made at the beginning of each leg and weekly thereafter. Static draft for *THOMAS JEFFERSON* is measured using a sight tube located in lower survey stores in the vicinity of frame 33. Additional static draft measurements are made as needed with changing conditions, such as changes in the ship's ballasting or loading. Lower survey stores is not vented to the atmosphere, and as a result, air pressure inside the ship can introduce an error in static draft measurements. As a result, a value of 0.1m was entered into the CARIS HVF as the uncertainty for static draft for the ship.

3101
Vessel offset measurements were made on *HSL 3101* on January 13, 2010 by NGS personnel. The NGS survey measured from established benchmarks on the vessel back to the reference point, in this case, the cross hairs on top of the IMU. From the surveyed benchmarks, the new RESON 7125SV, SSVS, and Odom CV200 installation offsets were measured using a steel tape. The Klein 5000 side scan was surveyed in a similar manner and offsets for the "heavy weight" and "light weight" systems were recorded.

Static draft measurements for HSL 3101 and HSL 3102 are determined using a sight tube to measure the waterline with respect to the reference point on the top of the IMU. These measurements are made during each patch test.

3102
Vessel offset measurements were also made on *HSL 3102* on January 13, 2010 by NGS personnel. The NGS survey measured from established benchmarks on the vessel back to the reference point on top of the IMU in the same manner as the survey of HSL 3101. From the surveyed benchmarks, the new RESON 7125SV, SSVS, and Odom CV200 installation offsets were measured using a steel tape. The Klein 5000 side scan was surveyed in a similar manner and offsets for the "heavy weight" and "light weight" systems were recorded.

Dynamic Draft

The *Thomas Jefferson* utilized an Elipsoid Referenced Survey (ERS) method for measuring dynamic draft for the ship, HSL 3101, and HSL 3102. This method has been termed Ellipsoid Referenced Dynamic Draft Measurement (ERDDM). Post-processed Smoothed Best Estimate Trajectory (SBET) altitude heights with respect to the ellipsoid were created in POSPac MMS 6.0 and used to measure dynamic draft.

The ERDDM was conducted by acquiring POSPac data while acquiring survey lines for the Echosounder method. The Echosounder method was modified slightly to provide additional drift values to isolate the effects of tide. This was achieved by going all stop at the end of each line and drifting dead in the water for 1 – 3 minutes. These all stop values provided visual break points for reference in the continuous POSPac data that was logged for the duration of survey operations for the day. During the ERDDM for HSL 3101, at rest periods were not acquired at the end of some of the lines. In these instances, vessel heading was used for visual break points in the POSPac data.

POSPac data was processed in POSPac MMS 5.3 and an SBET file was created. The vessel speed and the altitude plots were examined and data corresponding to the lines described in the Echosounder method above were exported into a spreadsheet and analyzed. The average vessel speed for each line and the average difference between at speed altitudes and at rest altitudes were computed and used to create a dynamic draft table.

APPROVAL SHEET

This Data Acquisition and Processing Report is respectfully submitted for the following projects:

OPR-E350-TJ-12, Southern Chesapeake Bay, VA
OPR-B340-TJ-12, Long Island Sound, NY
OPR-B370-TJ-12, Eastern Long Island Sound, NY
OPR-B363-TJ-12, Block Island Sound, RI
S-B935-TJ-12, NY Harbor and Vicinity Response

As Chief of Party, I have ensured that standard field surveying and processing procedures were adhered to during these projects in accordance with the Hydrographic Surveys Specifications and Deliverables (**4/2012**), Hydrographic Survey Technical Directives **HTD 2012-5**, and the Field Procedures Manual for Hydrographic Surveying (**4/2012**,).

I acknowledge that all of the information contained in this report is complete and accurate to the best of my knowledge.

This DAPR applies to all surveys completed in 2012 for the projects listed above.

Approved and Forwarded:

LT William G. Winner, NOAA Field Operations Officer	CDR Lawrence T. Krepp, NOAA Commanding Officer

Multibeam Echosounder Calibration

Field Unit: NOAA Ship THOMAS JEFFERSON

Date of Test: 3 Apr 2012

Calibrating Hydrographer(s): LT Winner

MULTIBEAM SYSTEM INFORMATION

Multibeam Echosounder System: Reson 7125 SV1 400 kHz 512 beams

System Location: 3101

Sonar Serial Number: Rx: 1409071; Tx 400: 2308097; Tx 200: 4408356

Processing Unit Serial Number: 1812018

Date of Most Recent EED / Factory Checkout:

VESSEL INFORMATION

Sonar Mounting Configuration: hull-mounted

Date of Current Vessel Offset Measurement / Verification:

Description of Positioning System: POS/MV version 4 w/ Precise Timing

Date of Most Recent Positioning System Calibration:

TEST INFORMATION

Test Date(s) / DN(s): 3 Apr 2012; 094

System Operator(s): HST Glomb

Wind / Seas / Sky:

Locality: Chesapeake Bay

Sub-Locality: Cape Charles

Bottom Type: sandy

Approximate Average Water Depth: 13 meters

DATA ACQUISITION INFORMATION

Line Number	Heading	Speed
400_1706	0	4
400_1711	180	4.4
401_1715	0	4
401_1719	180	4.3
402_1723	0	4.1
402_1728	180	4.3
403_1735	270	2.2
403_1741	270	4.2

TEST RESULTS

Navigation Timing Error: 0.00

Pitch Timing Error:0.00

Roll Timing Error: 0.00

Pitch Bias: 1.33

Roll Bias: -0.44

Heading Bias: 0.97

Resulting CARIS HIPS HVF File Name: TJ_3101_Reson7125_400kHz

NARRATIVE

Values match closely with last year's values. Yaw lines did not overlap the object, so other lines had to be used.

Multibeam Echosounder Calibration

Field Unit: NOAA Ship THOMAS JEFFERSON

Date of Test: 4 Apr 2012

Calibrating Hydrographer(s): LT Winner

MULTIBEAM SYSTEM INFORMATION

Multibeam Echosounder System: 7125 SV1 400 kHz 512 beams

System Location: 3102

Sonar Serial Number: Rx: 0309006; Tx 400: 2208005; Tx 200: 2909185

Processing Unit Serial Number: 1812012

Date of Most Recent EED / Factory Checkout:

VESSEL INFORMATION

Sonar Mounting Configuration: hull-mounted

Date of Current Vessel Offset Measurement / Verification: Jan 2011

Description of Positioning System: POS/MV version 4 w/ Precise Timing

Date of Most Recent Positioning System Calibration:

TEST INFORMATION

Test Date(s) / DN(s): 4 APR 2012; 095

System Operator(s): HST Glomb

Wind / Seas / Sky:

Locality: Chesapeake Bay

Sub-Locality: Cape Charles

Bottom Type: sandy

Approximate Average Water Depth: 13 meters

DATA ACQUISITION INFORMATION

Line Number	Heading	Speed
400_1320	180	4.2
400_1324	0	4.2
401_1327	180	4.2
401_1330	0	4.3
402_1334	180	4.1
402_1338	0	4.5
403_1344	270	2.4
403_1349	270	4.7

TEST RESULTS

Navigation Timing Error: 0.00

Pitch Timing Error:0.00

Roll Timing Error: 0.00

Pitch Bias: 0.37

Roll Bias: -0.94

Heading Bias: -1.4

Resulting CARIS HIPS HVF File Name: TJ_3102_Reson7125_400kHz.hvf

NARRATIVE

Values match closely with last year's values. Yaw lines did not overlap the object, so other lines had to be used.

CTD - 0285, S222

SEA-BIRD ELECTRONICS, INC.
13431 NE 20th St. Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Temperature Calibration Report

Customer: Atlantic Marine Center

Job Number: 66950

Date of Report: 12/14/2011

Model Number: SBE 19

Serial Number: 192472-0285

Temperature sensors are normally calibrated 'as received', without adjustments, allowing a determination sensor drift. If the calibration identifies a problem, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing coefficients to convert sensor frequency to temperature. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients. The coefficient 'offset' allows a small correction for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 12/14/2011

Drift since last cal: -0.00095 **Degrees Celsius/year**

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date:

Drift since Last cal: **Degrees Celsius/year**

Comments:

CTD - 0285, S222

SEA-BIRD ELECTRONICS, INC.
13431 NE 20th Street Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Conductivity Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	66950	**Date of Report:**	12/14/2011
Model Number:	SBE 19	**Serial Number:**	192472-0285

Conductivity sensors are normally calibrated 'as received', without cleaning or adjustments, allowing a determination of sensor drift. If the calibration identifies a problem or indicates cell cleaning is necessary, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing the coefficients used to convert sensor frequency to conductivity. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients. The coefficient 'slope' allows small corrections for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair or cleaning apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 12/14/2011 Drift since last cal: -0.00120 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: PSU/month*

Comments:

**Measured at 3.0 S/m*

Cell cleaning and electrode replatinizing tend to 'reset' the conductivity sensor to its original condition. Lack of drift in post-cleaning-calibration indicates geometric stability of the cell and electrical stability of the sensor circuit.

Sea-Bird Electronics, Inc.
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Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0285
CALIBRATION DATE: 14-Dec-11

SBE19 TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS
g = 4.12500315e-003
h = 5.75194956e-004
i = -1.00004252e-006
j = -3.14777854e-006
f0 = 1000.0

IPTS-68 COEFFICIENTS
a = 3.64764105e-003
b = 5.70460005e-004
c = 6.87852369e-006
d = -3.14771798e-006
f0 = 2297.577

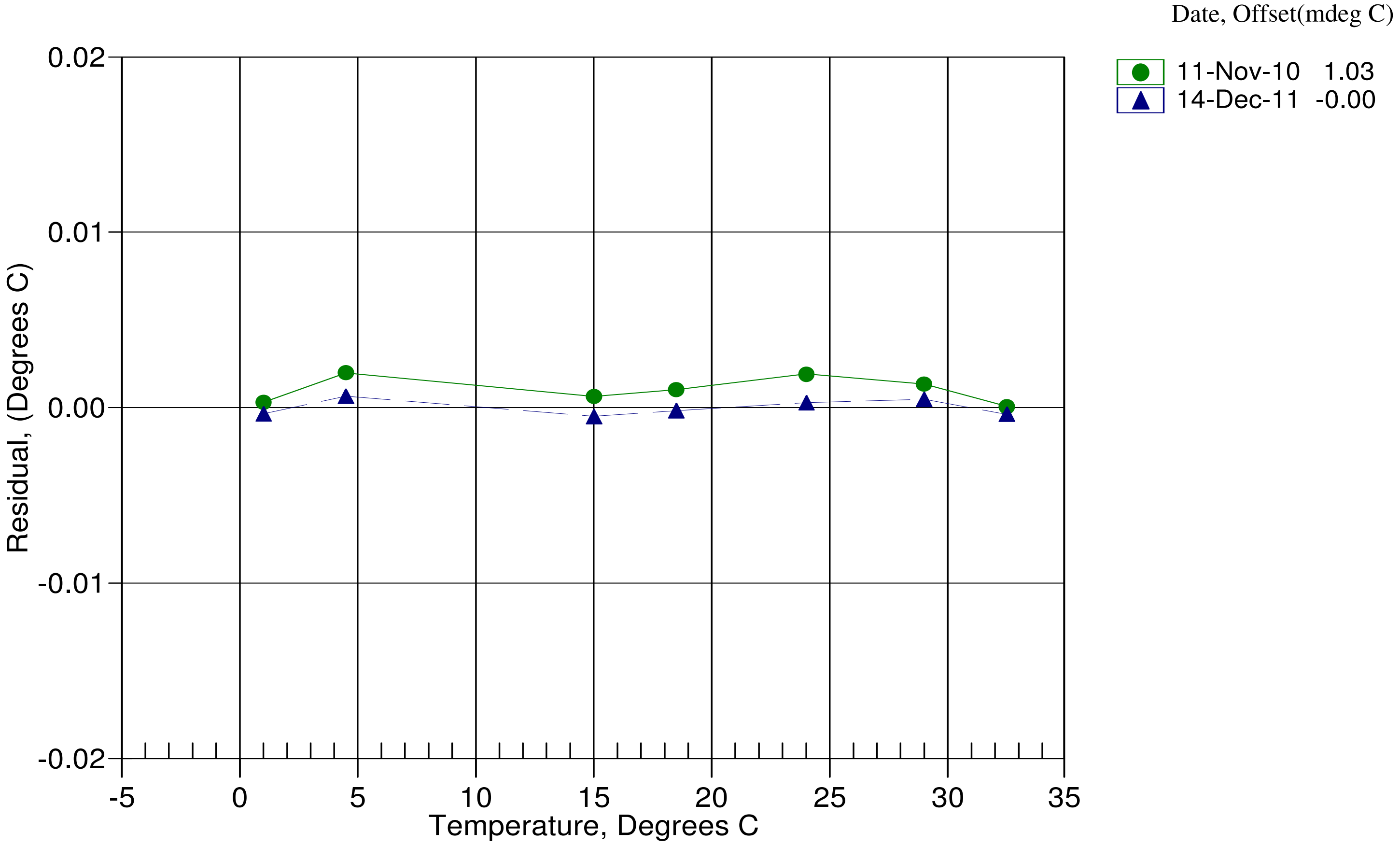
BATH TEMP (ITS-90)	INSTRUMENT FREQ (Hz)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
0.9999	2297.577	0.9995	-0.00036
4.5000	2490.753	4.5007	0.00065
15.0000	3139.098	14.9995	-0.00049
18.5000	3379.524	18.4998	-0.00017
23.9999	3783.259	24.0002	0.00027
29.0000	4178.885	29.0005	0.00047
32.5000	4472.560	32.4996	-0.00038

Temperature ITS-90 = $1/\{g + h[ln(f_0/f)] + i[ln^2(f_0/f)] + j[ln^3(f_0/f)]\} - 273.15$ (°C)

Temperature IPTS-68 = $1/\{a + b[ln(f_0/f)] + c[ln^2(f_0/f)] + d[ln^3(f_0/f)]\} - 273.15$ (°C)

Following the recommendation of JPOTS: T_{68} is assumed to be 1.00024 * T_{90} (-2 to 35 °C)

Residual = instrument temperature - bath temperature



CTD - 0285, S222

Sea-Bird Electronics, Inc.

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Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0285
CALIBRATION DATE: 03-Jan-12

SBE19 PRESSURE CALIBRATION DATA
5000 psia S/N 133807 TCV: -121

QUADRATIC COEFFICIENTS:

PA0 = 2.491586e+003
PA1 = -6.501956e-001
PA2 = -5.844651e-008

STRAIGHT LINE FIT:

M = -6.502140e-001
B = 2.491225e+003

PRESSURE PSIA	INST OUTPUT(N)	COMPUTED PSIA	ERROR %FS	LINEAR PSIA	ERROR %FS
14.75	3806.0	16.09	0.03	16.51	0.04
1115.01	2118.0	1114.21	-0.02	1114.07	-0.02
2115.18	582.0	2113.15	-0.04	2112.80	-0.05
3115.20	-960.0	3115.72	0.01	3115.43	0.00
4115.23	-2498.0	4115.41	0.00	4115.46	0.00
5065.23	-3958.0	5064.14	-0.02	5064.77	-0.01
4115.21	-2499.0	4116.06	0.02	4116.11	0.02
3115.17	-962.0	3117.02	0.04	3116.73	0.03
2115.17	580.0	2114.45	-0.01	2114.10	-0.02
1115.03	2116.0	1115.51	0.01	1115.37	0.01
14.75	3809.0	14.14	-0.01	14.56	-0.00

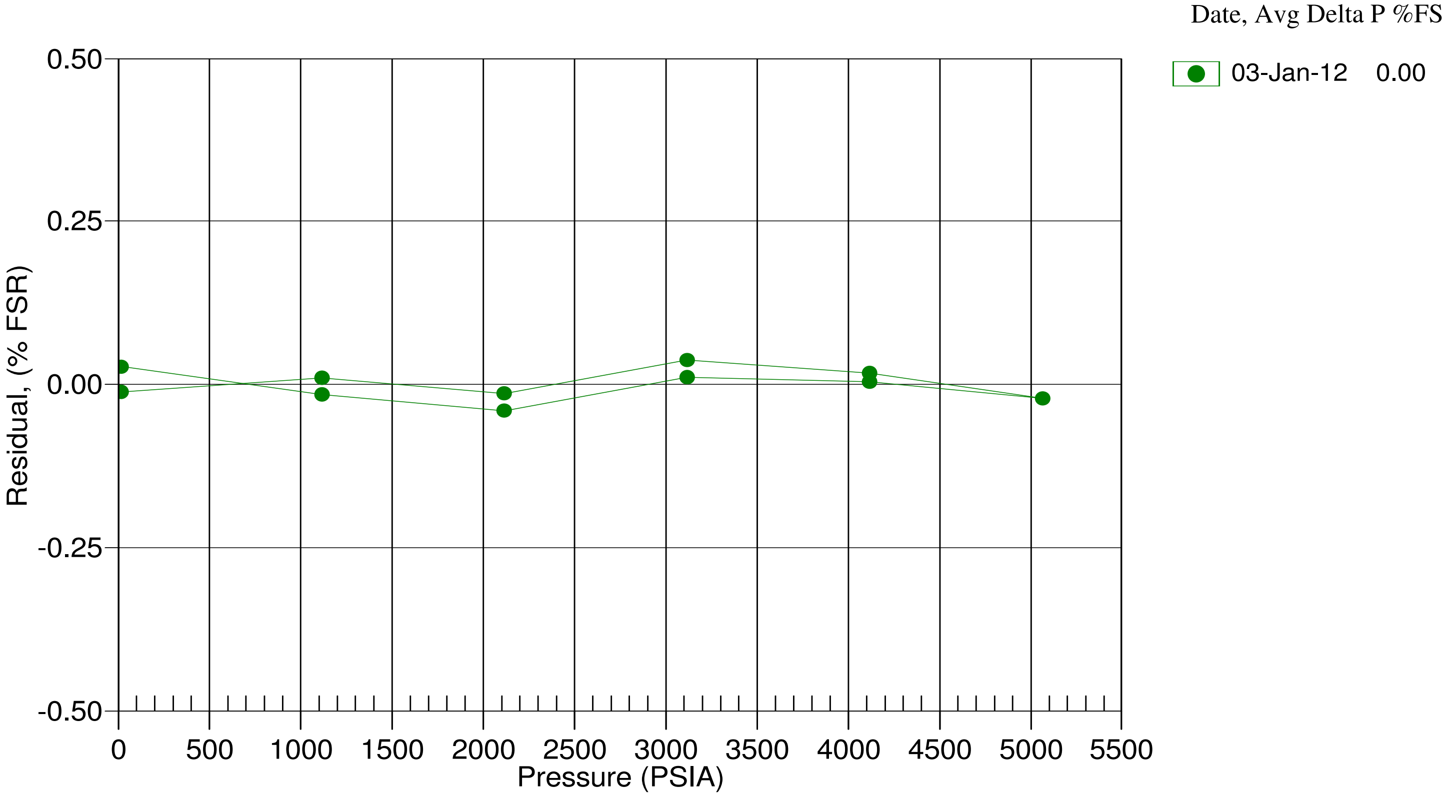
Straight Line Fit:

Pressure (psia) = M * N + B (N = binary output)

Quadratic Fit:

pressure (psia) = PA0 + PA1 * N + PA2 * N^2

Residual = (instrument pressure - true pressure) * 100 / Full Scale Range



CTD - 0285, S222

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13431 NE 20th Street, Bellevue, WA 98005-2010 USA
Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 0285
CALIBRATION DATE: 14-Dec-11

SBE19 CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

GHIJ COEFFICIENTS

g = -4.08457931e+000
h = 4.87502825e-001
i = 1.10067345e-003
j = -1.77211107e-005
CPcor = -9.5700e-008 (nominal)
CTcor = 3.2500e-006 (nominal)

ABCDM COEFFICIENTS

a = 7.52840059e-003
b = 4.77680955e-001
c = -4.07135887e+000
d = -9.32378835e-005
m = 2.4
CPcor = -9.5700e-008 (nominal)

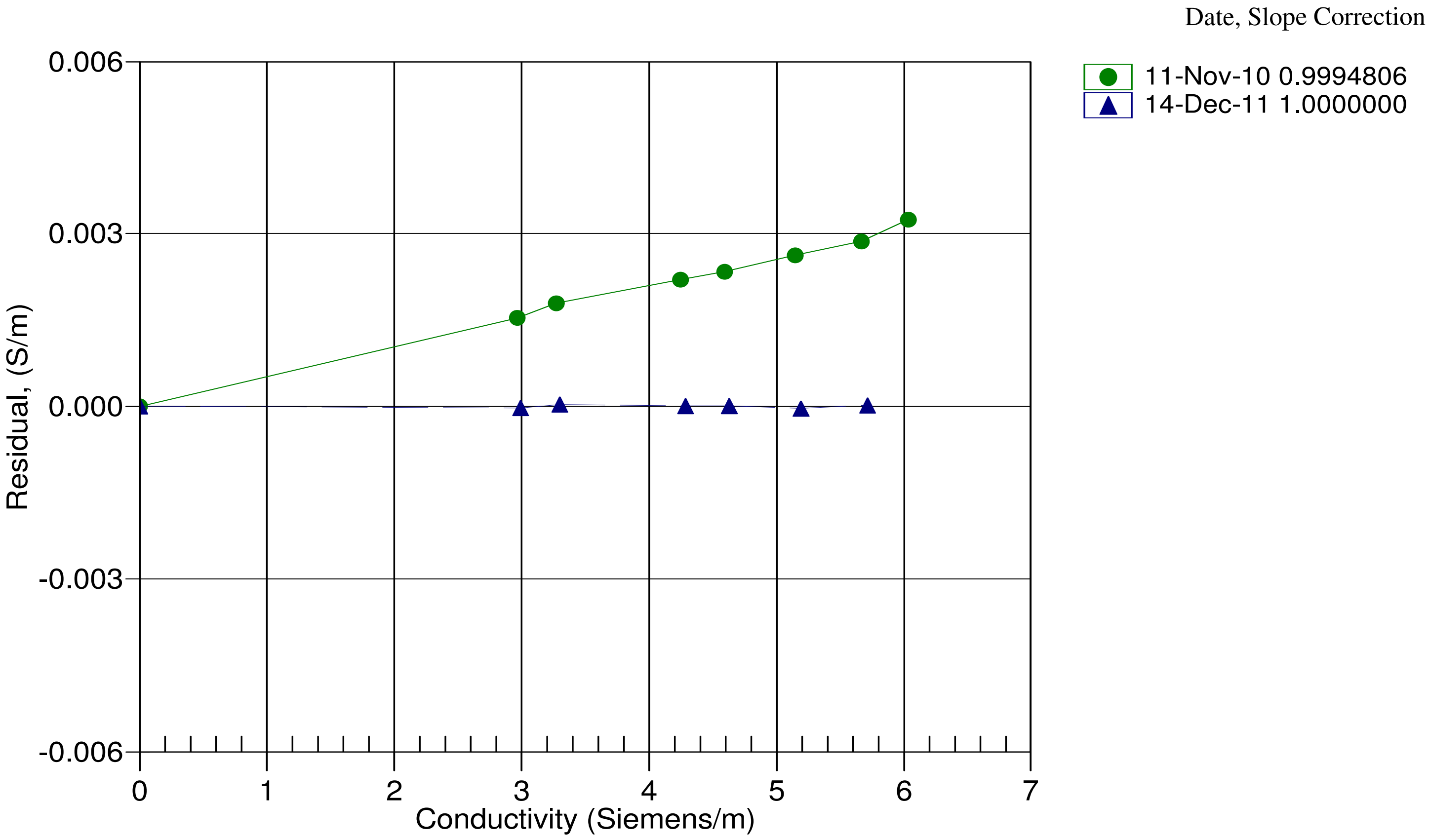
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (kHz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2.88563	0.00000	0.00000
0.9999	34.9717	2.98797	8.28002	2.98794	-0.00003
4.5000	34.9512	3.29619	8.64513	3.29622	0.00003
15.0000	34.9072	4.28158	9.71912	4.28159	0.00001
18.5000	34.8971	4.62793	10.06899	4.62793	0.00001
23.9999	34.8858	5.18781	10.60972	5.18777	-0.00004
29.0000	34.8780	5.71128	11.09115	5.71130	0.00002

Conductivity = $(g + hf^2 + if^3 + jf^4) /10(1 + \delta t + \varepsilon p)$ Siemens/meter

Conductivity = $(af^m + bf^2 + c + dt) / [10 (1 + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = (instrument conductivity - bath conductivity) using g, h, i, j coefficients



CTD - 4486, HSL 3101

SEA-BIRD ELECTRONICS, INC.
13431 NE 20th St. Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Temperature Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	66950	**Date of Report:**	12/14/2011
Model Number:	SBE 19Plus	**Serial Number:**	19P33589-4486

Temperature sensors are normally calibrated 'as received', without adjustments, allowing a determination sensor drift. If the calibration identifies a problem, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing coefficients to convert sensor frequency to temperature. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients. The coefficient 'offset' allows a small correction for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 12/14/2011

Drift since last cal: -0.00030 **Degrees Celsius/year**

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date:

Drift since Last cal: **Degrees Celsius/year**

Comments:

SEA-BIRD ELECTRONICS, INC.
13431 NE 20th Street Bellevue, Washington 98005 USA
Phone: (425) 643-9866 Fax: (425) 643-9954 www.seabird.com

Conductivity Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	66950	**Date of Report:**	12/14/2011
Model Number:	SBE 19Plus	**Serial Number:**	19P33589-4486

Conductivity sensors are normally calibrated 'as received', without cleaning or adjustments, allowing a determination of sensor drift. If the calibration identifies a problem or indicates cell cleaning is necessary, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing the coefficients used to convert sensor frequency to conductivity. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients. The coefficient 'slope' allows small corrections for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair or cleaning apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 12/14/2011 Drift since last cal: -0.00020 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: PSU/month*

Comments:

****Measured at 3.0 S/m***

Cell cleaning and electrode replatinizing tend to 'reset' the conductivity sensor to its original condition. Lack of drift in post-cleaning-calibration indicates geometric stability of the cell and electrical stability of the sensor circuit.

CTD - 4486, HSL 3101

Sea-Bird Electronics, Inc.

13431 NE 20th Street, Bellevue, WA 98005-2010 USA
Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 4486
CALIBRATION DATE: 14-Dec-11

SBE19plus TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = 1.275141e-003
a1 = 2.593836e-004
a2 = 3.412295e-007
a3 = 1.367993e-007

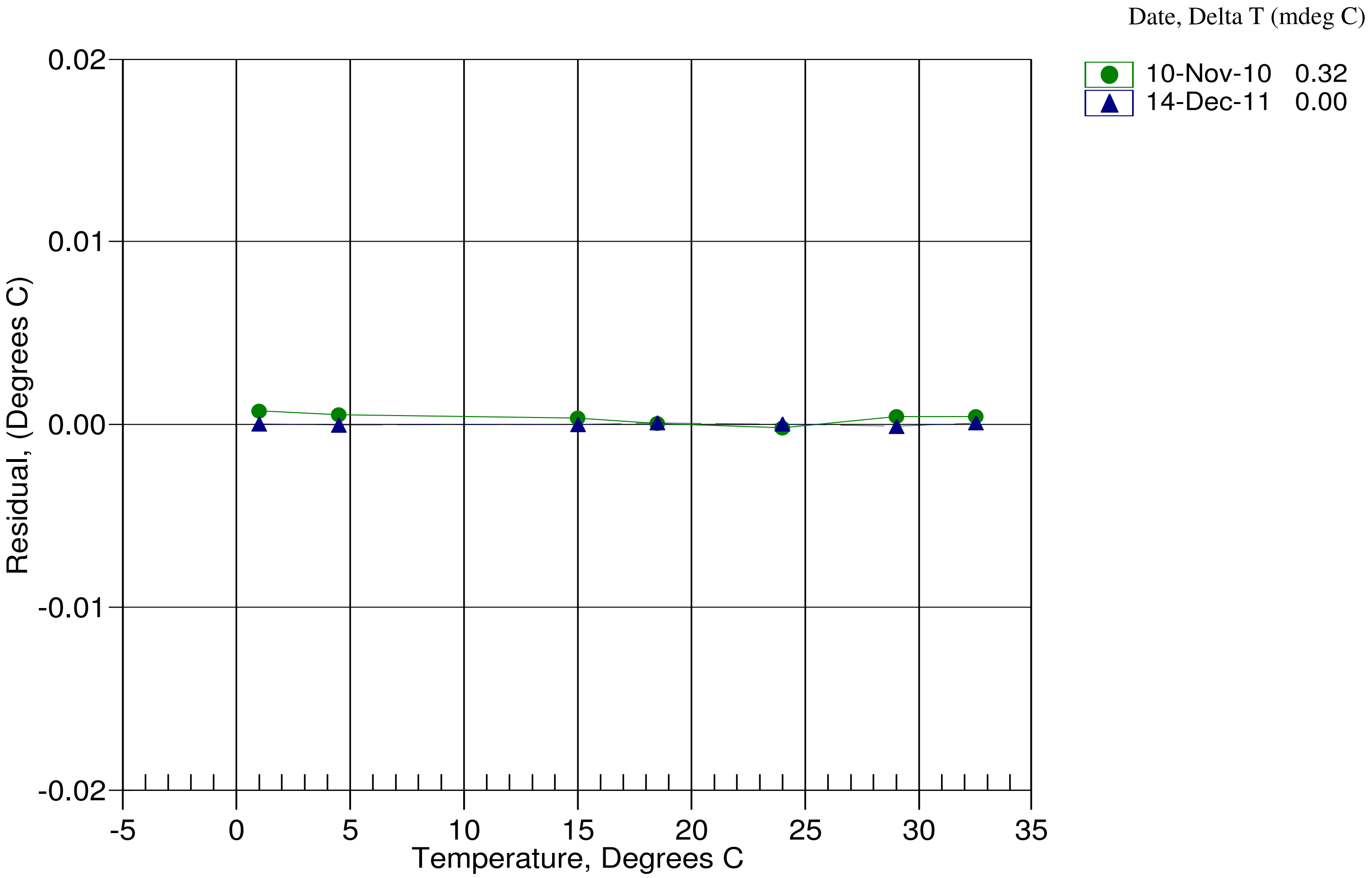
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT(n)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
0.9999	604355.583	0.9999	0.0000
4.5000	535781.867	4.5000	-0.0000
15.0000	366318.467	15.0000	-0.0000
18.5000	320996.770	18.5001	0.0001
23.9999	259598.117	23.9999	0.0000
29.0000	212961.533	28.9999	-0.0001
32.5000	184834.656	32.5001	0.0001

$MV = (n - 524288) / 1.6e+007$

$R = (MV * 2.900e+009 + 1.024e+008) / (2.048e+004 - MV * 2.0e+005)$

Temperature ITS-90 = $1/\{a0 + a1[ln(R)] + a2[ln^2(R)] + a3[ln^3(R)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



CTD - 4486, HSL 3101

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SENSOR SERIAL NUMBER: 4486
CALIBRATION DATE: 09-Dec-11

SBE19plus PRESSURE CALIBRATION DATA
508 psia S/N 2799

COEFFICIENTS:

PA0 = 2.017286e-002
PA1 = 1.549533e-003
PA2 = 7.596469e-012
PTEMPA0 = -7.556904e+001
PTEMPA1 = 4.833845e+001
PTEMPA2 = -2.487770e-001

PTCA0 = 5.246207e+005
PTCA1 = 2.799682e+000
PTCA2 = -1.050025e-001
PTCB0 = 2.468737e+001
PTCB1 = -7.250000e-004
PTCB2 = 0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE PSIA	INST OUTPUT	THERMISTOR OUTPUT	COMPUTED PRESSURE	ERROR %FSR
14.72	534117.0	2.0	14.73	0.00
104.99	592298.0	2.0	104.97	-0.00
204.97	656708.0	2.0	204.94	-0.01
304.96	721100.0	2.0	304.94	-0.00
404.97	785446.0	2.0	404.94	-0.01
504.96	849768.0	2.0	504.96	-0.00
404.97	785478.0	2.0	404.99	0.00
304.97	721144.0	2.0	305.01	0.01
204.99	656749.0	2.0	205.01	0.00
105.03	592333.0	2.0	105.03	-0.00
14.71	534112.0	2.0	14.72	0.00

THERMAL CORRECTION

TEMP ITS90	THERMISTOR OUTPUT	INST OUTPUT
32.50	2.26	534254.28
29.00	2.19	534271.06
24.00	2.08	534281.78
18.50	1.97	534291.91
15.00	1.89	534293.49
4.50	1.67	534285.87
1.00	1.60	534278.85

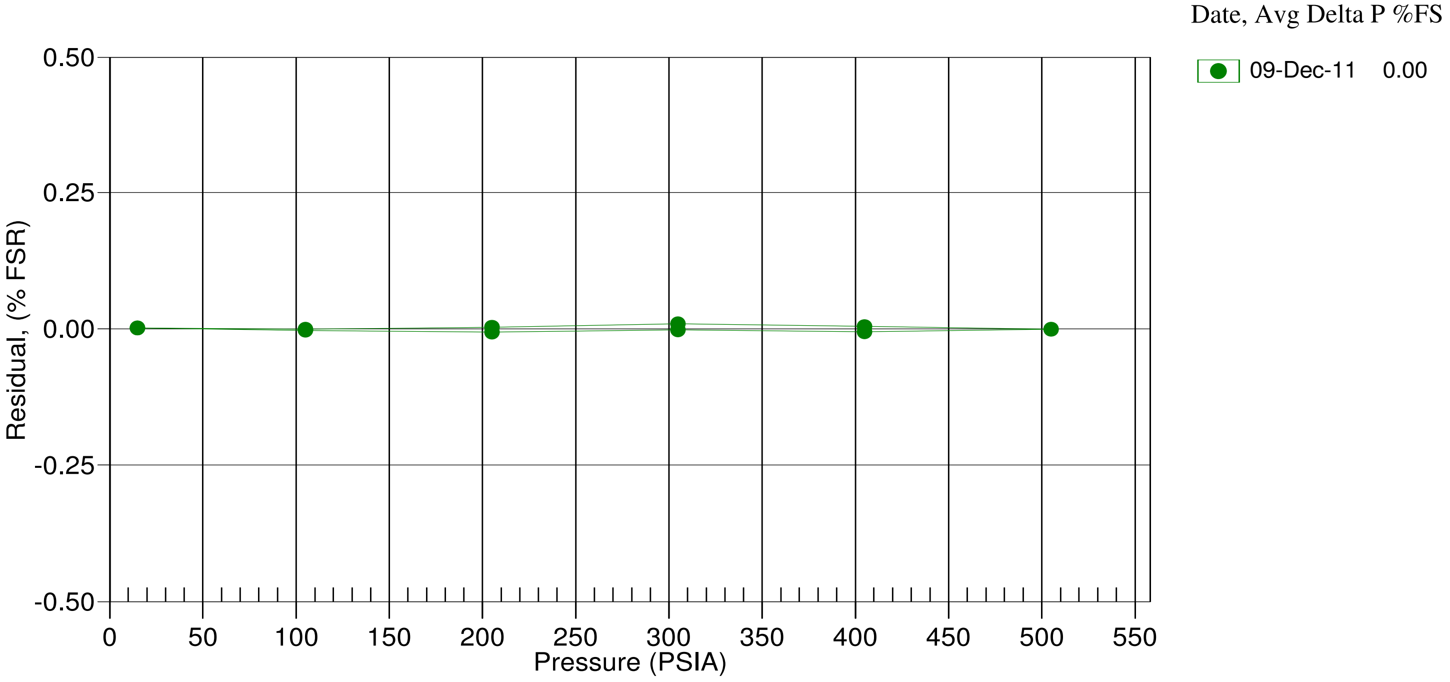
TEMP(ITS90)	SPAN(mV)
-5.00	24.69
35.00	24.66

y = thermistor output; $t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$

$x = \text{pressure output} - PTCA0 - PTCA1 * t - PTCA2 * t^2$

$n = x * PTCB0 / (PTCB0 + PTCB1 * t + PTCB2 * t^2)$

$\text{pressure (psia)} = PA0 + PA1 * n + PA2 * n^2$



CTD - 4486, HSL 3101

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SENSOR SERIAL NUMBER: 4486
CALIBRATION DATE: 14-Dec-11

SBE19plus CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g = -1.029827e+000
h = 1.436052e-001
i = -2.467991e-004
j = 3.934339e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006

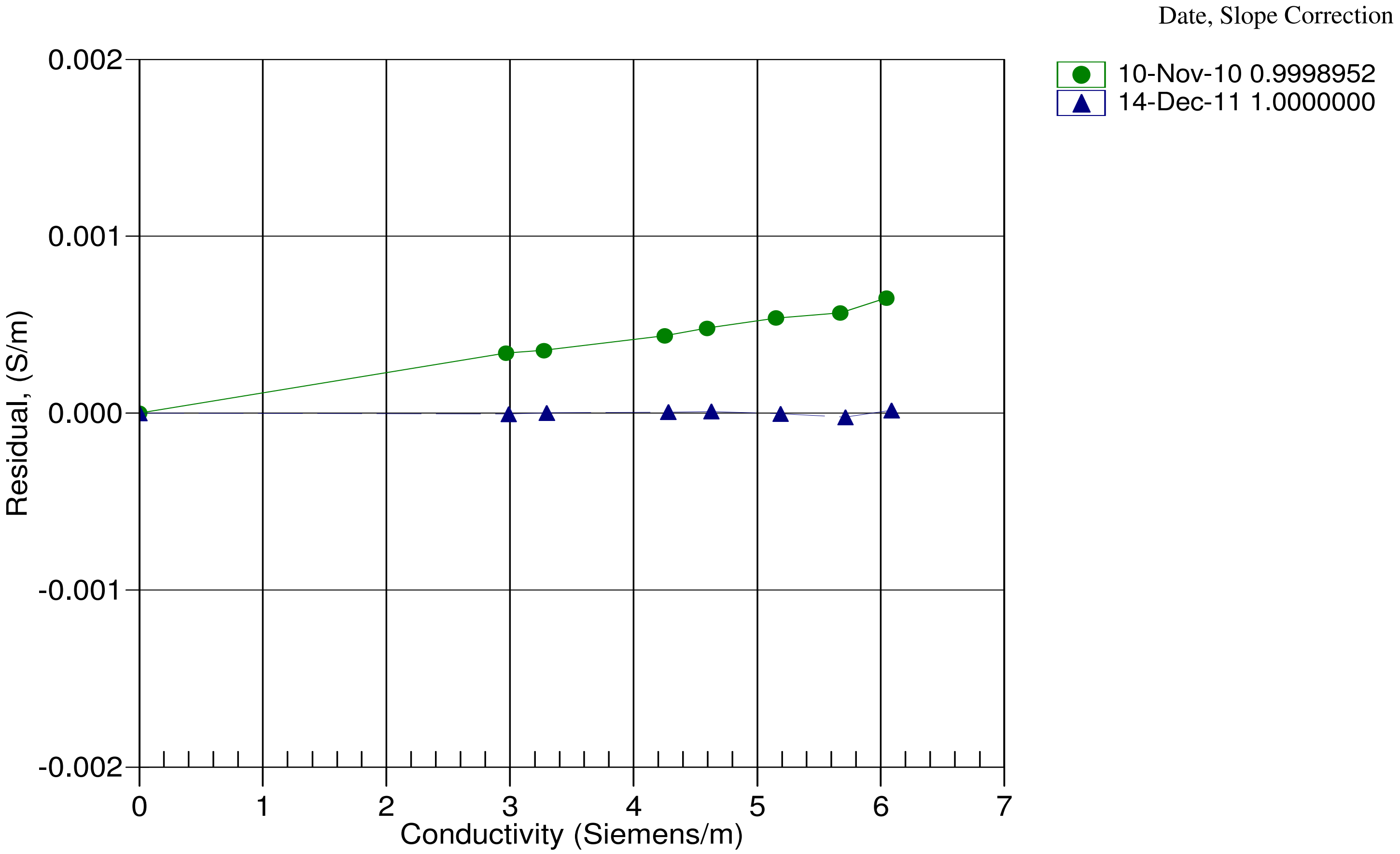
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2681.46	0.0000	0.00000
0.9999	34.9717	2.98797	5293.19	2.9880	-0.00001
4.5000	34.9512	3.29619	5491.83	3.2962	0.00000
15.0000	34.9072	4.28158	6082.71	4.2816	0.00000
18.5000	34.8971	4.62793	6276.92	4.6279	0.00001
23.9999	34.8858	5.18781	6578.43	5.1878	-0.00000
29.0000	34.8780	5.71128	6847.99	5.7113	-0.00002
32.5000	34.8714	6.08451	7033.70	6.0845	0.00002

f = INST FREQ / 1000.0

Conductivity = $(g + hf^2 + if^3 + jf^4) / (1 + \delta t + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = instrument conductivity - bath conductivity



CTD - 4487, HSL 3102

SEA-BIRD ELECTRONICS, INC.
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Temperature Calibration Report

Customer: Atlantic Marine Center

Job Number:	66950	**Date of Report:**	12/14/2011
Model Number:	SBE 19Plus	**Serial Number:**	19P33589-4487

Temperature sensors are normally calibrated 'as received', without adjustments, allowing a determination sensor drift. If the calibration identifies a problem, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing coefficients to convert sensor frequency to temperature. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients. The coefficient 'offset' allows a small correction for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 12/14/2011

Drift since last cal: -0.00007 **Degrees Celsius/year**

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date:

Drift since Last cal: **Degrees Celsius/year**

Comments:

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Conductivity Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	66950	**Date of Report:**	12/14/2011
Model Number:	SBE 19Plus	**Serial Number:**	19P33589-4487

Conductivity sensors are normally calibrated 'as received', without cleaning or adjustments, allowing a determination of sensor drift. If the calibration identifies a problem or indicates cell cleaning is necessary, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing the coefficients used to convert sensor frequency to conductivity. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients. The coefficient 'slope' allows small corrections for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair or cleaning apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 12/14/2011 Drift since last cal: +0.00020 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING' ☐ Performed ☑ Not Performed

Date: Drift since Last cal: PSU/month*

Comments:

****Measured at 3.0 S/m***

Cell cleaning and electrode replatinizing tend to 'reset' the conductivity sensor to its original condition. Lack of drift in post-cleaning-calibration indicates geometric stability of the cell and electrical stability of the sensor circuit.

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SENSOR SERIAL NUMBER: 4487
CALIBRATION DATE: 14-Dec-11

SBE19plus TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = 1.208646e-003
a1 = 2.630433e-004
a2 = -2.424026e-007
a3 = 1.540871e-007

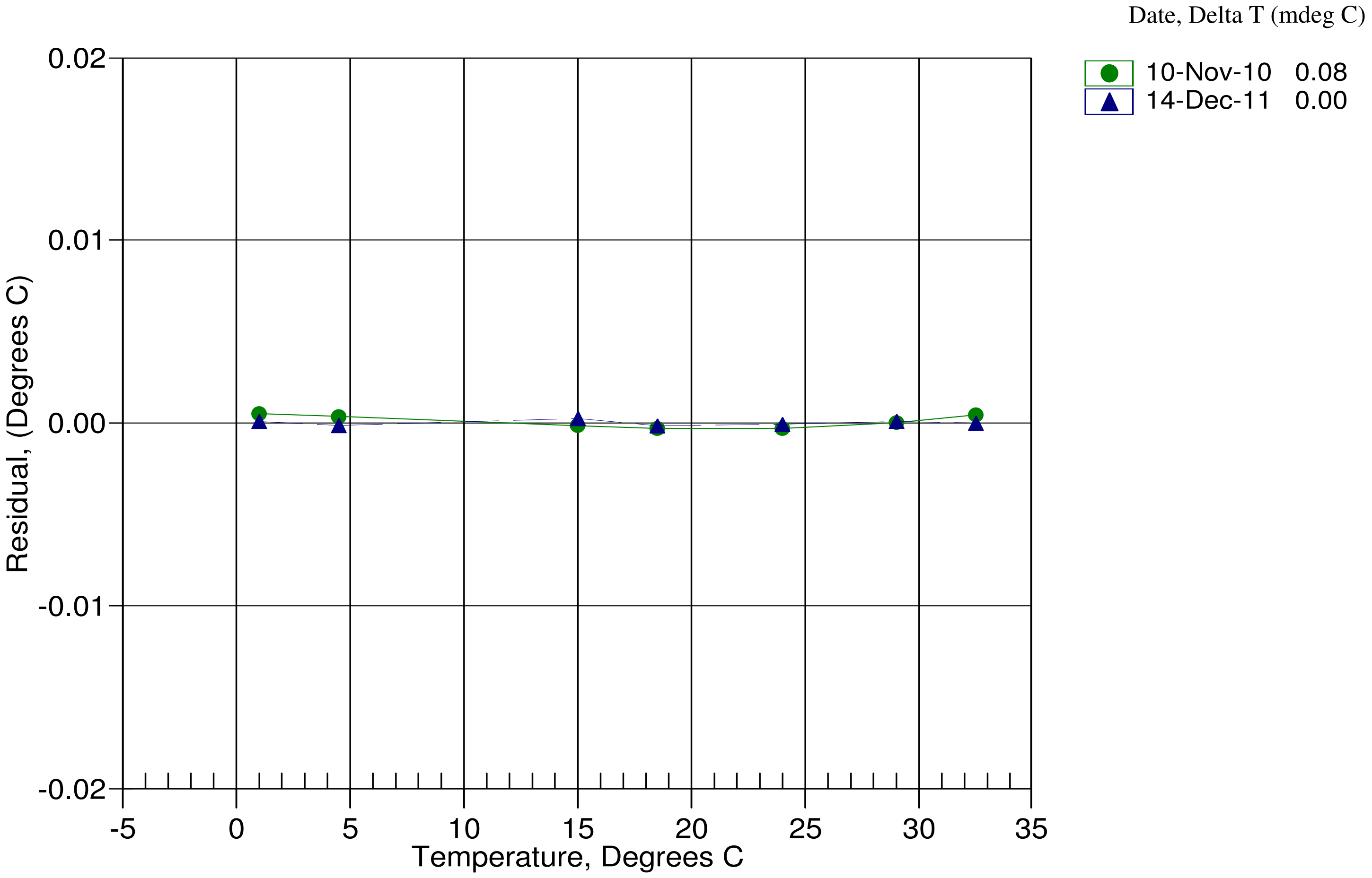
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT(n)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
0.9999	713466.450	1.0000	0.0001
4.5000	638149.217	4.4999	-0.0001
15.0000	447157.683	15.0002	0.0002
18.5000	394891.918	18.4998	-0.0002
23.9999	323255.083	23.9998	-0.0001
29.0000	268206.167	29.0001	0.0001
32.5000	234744.033	32.5000	-0.0000

MV = (n - 524288) / 1.6e+007

R = (MV * 2.900e+009 + 1.024e+008) / (2.048e+004 - MV * 2.0e+005)

Temperature ITS-90 = 1/{a0 + a1[ln(R)] + a2[ln^2(R)] + a3[ln^3(R)]} - 273.15 (°C)

Residual = instrument temperature - bath temperature



CTD - 4487, HSL 3102

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SENSOR SERIAL NUMBER: 4487
CALIBRATION DATE: 09-Dec-11

SBE19plus PRESSURE CALIBRATION DATA
508 psia S/N 2837

COEFFICIENTS:

PA0 = 8.061338e-002
PA1 = 1.555712e-003
PA2 = 7.319688e-012
PTEMPA0 = -7.398211e+001
PTEMPA1 = 4.843255e+001
PTEMPA2 = -1.939711e-001

PTCA0 = 5.243986e+005
PTCA1 = 4.572438e+000
PTCA2 = -1.008803e-001
PTCB0 = 2.498675e+001
PTCB1 = -5.000000e-005
PTCB2 = 0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE PSIA	INST OUTPUT	THERMISTOR OUTPUT	COMPUTED PRESSURE	ERROR %FSR
14.72	533864.0	2.0	14.73	0.00
104.99	591849.0	2.0	104.97	-0.00
204.97	656050.0	2.0	204.95	-0.01
304.96	720229.0	2.0	304.95	-0.00
404.97	784363.0	2.0	404.94	-0.01
504.96	848475.0	2.0	504.96	-0.00
404.97	784393.0	2.0	404.99	0.00
304.97	720262.0	2.0	305.00	0.01
204.99	656089.0	2.0	205.01	0.00
105.03	591885.0	2.0	105.03	-0.00
14.71	533861.0	2.0	14.72	0.00

THERMAL CORRECTION

TEMP ITS90	THERMISTOR OUTPUT	INST OUTPUT
32.50	2.22	534013.67
29.00	2.15	534019.36
24.00	2.04	534020.95
18.50	1.92	534022.77
15.00	1.85	534017.41
4.50	1.63	533989.33
1.00	1.56	533975.94

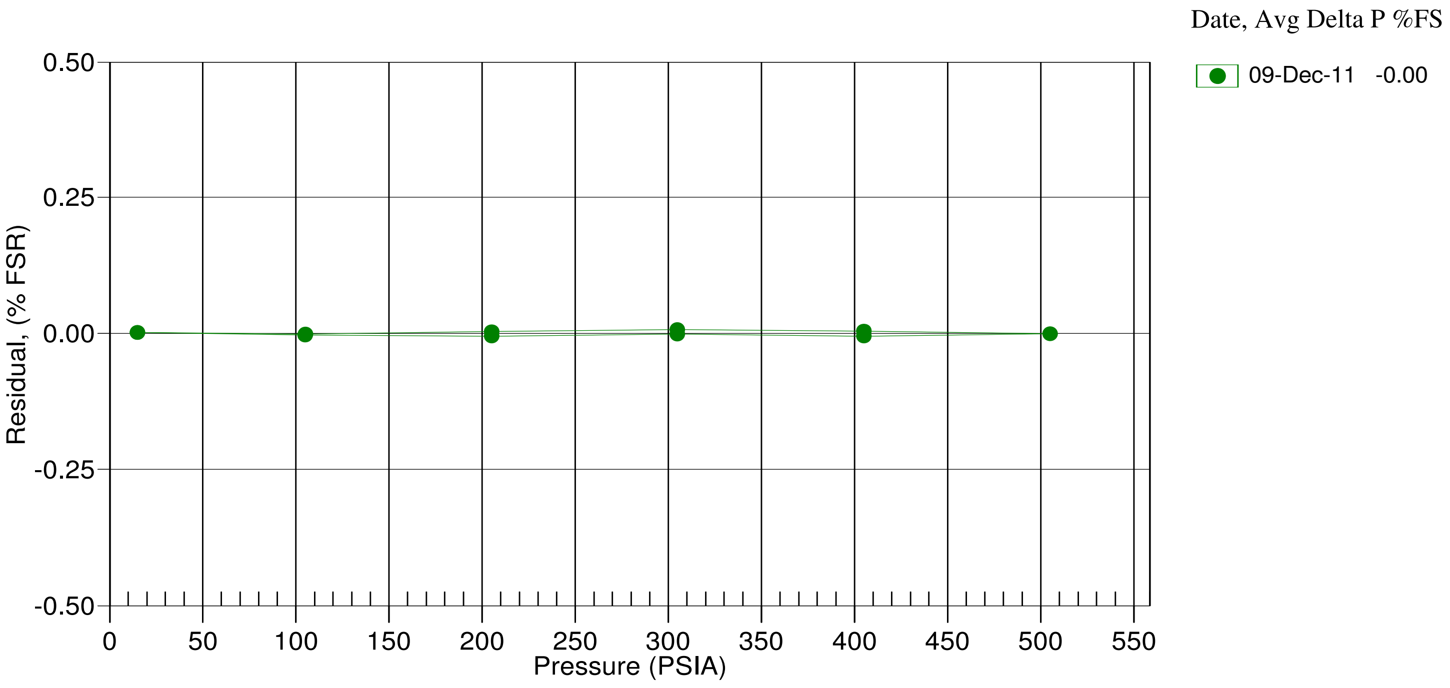
TEMP(ITS90)	SPAN(mV)
-5.00	24.99
35.00	24.98

y = thermistor output; $t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$

$x = \text{pressure output} - PTCA0 - PTCA1 * t - PTCA2 * t^2$

$n = x * PTCB0 / (PTCB0 + PTCB1 * t + PTCB2 * t^2)$

$\text{pressure (psia)} = PA0 + PA1 * n + PA2 * n^2$



CTD - 4487, HSL 3102

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SENSOR SERIAL NUMBER: 4487
CALIBRATION DATE: 14-Dec-11

SBE19plus CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

g = -1.021817e+000
h = 1.396141e-001
i = -2.206344e-004
j = 3.674517e-005

CPcor = -9.5700e-008
CTcor = 3.2500e-006

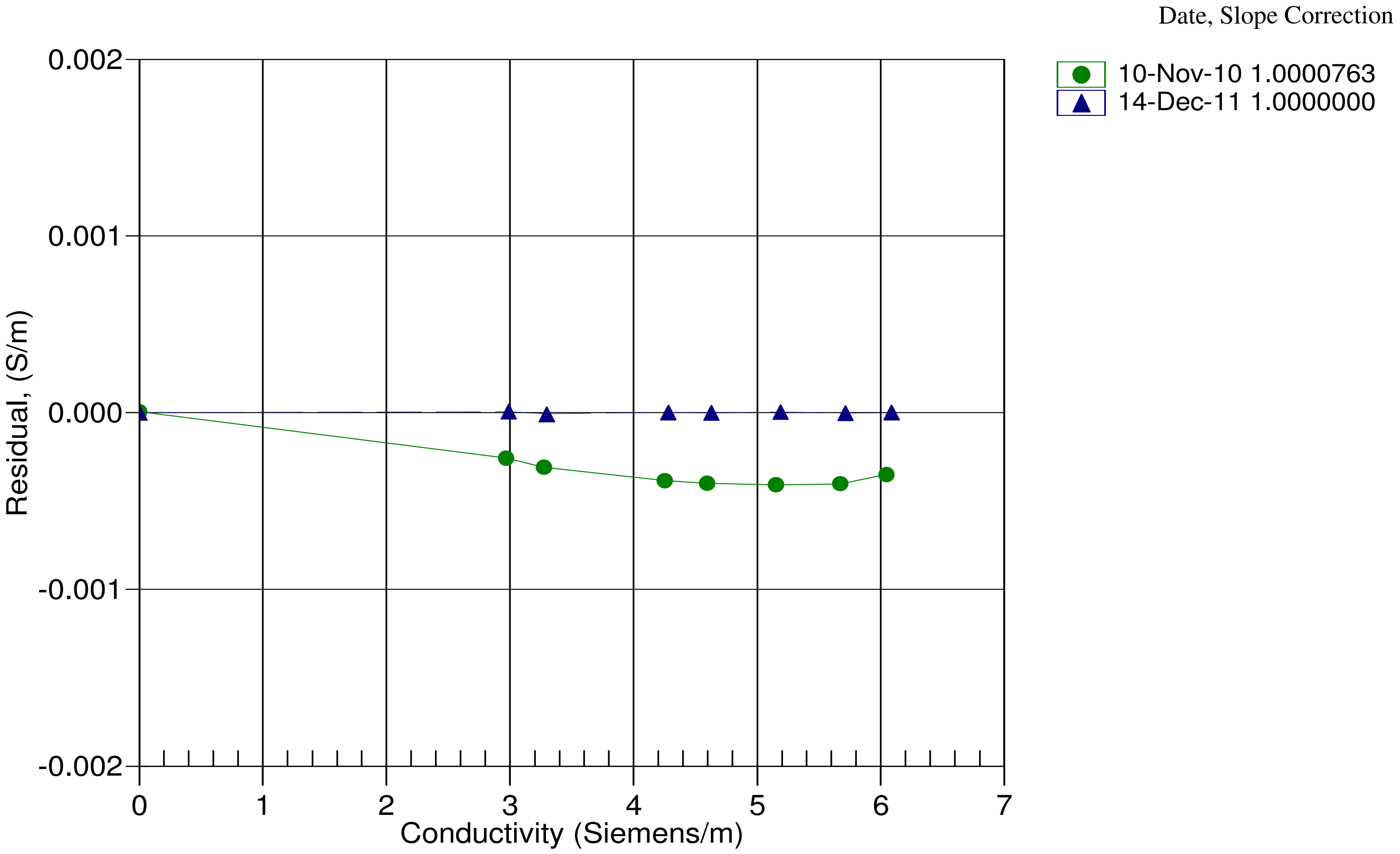
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2708.52	0.0000	0.00000
0.9999	34.9717	2.98797	5361.59	2.9880	0.00001
4.5000	34.9512	3.29619	5563.14	3.2962	-0.00001
15.0000	34.9072	4.28158	6162.62	4.2816	0.00000
18.5000	34.8971	4.62793	6359.62	4.6279	-0.00000
23.9999	34.8858	5.18781	6665.47	5.1878	0.00000
29.0000	34.8780	5.71128	6938.89	5.7113	-0.00000
32.5000	34.8714	6.08451	7127.23	6.0845	0.00000

f = INST FREQ / 1000.0

Conductivity = $(g + hf^2 + if^3 + jf^4) / (1 + \delta t + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = instrument conductivity - bath conductivity



CTD - 6667, S222 (Spare)

SEA-BIRD ELECTRONICS, INC.
13431 NE 20th St. Bellevue, Washington 98005 USA
Phone: (425) 643-9866   Fax: (425) 643-9954 www.seabird.com

Temperature Calibration Report

Customer:	Atlantic Marine Center		
Job Number:	66950	**Date of Report:**	12/20/2011
Model Number	SBE 19Plus	**Serial Number:**	19P60744-6667

Temperature sensors are normally calibrated 'as received', without adjustments, allowing a determination sensor drift. If the calibration identifies a problem, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing coefficients to convert sensor frequency to temperature. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients. The coefficient 'offset' allows a small correction for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair apply only to subsequent data.

'AS RECEIVED CALIBRATION' ☑ Performed ☐ Not Performed

Date: 12/17/2011

Drift since last cal: +0.00019 **Degrees Celsius/year**

Comments:

'CALIBRATION AFTER REPAIR' ☐ Performed ☑ Not Performed

Date:

Drift since Last cal: **Degrees Celsius/year**

Comments:

CTD - 6667, S222 (Spare)

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Conductivity Calibration Report

Customer: Atlantic Marine Center

Job Number: 66950

Date of Report: 12/20/2011

Model Number SBE 19Plus

Serial Number: 19P60744-6667

Conductivity sensors are normally calibrated 'as received', without cleaning or adjustments, allowing a determination of sensor drift. If the calibration identifies a problem or indicates cell cleaning is necessary, then a second calibration is performed after work is completed. The 'as received' calibration is not performed if the sensor is damaged or non-functional, or by customer request.

An 'as received' calibration certificate is provided, listing the coefficients used to convert sensor frequency to conductivity. Users must choose whether the 'as received' calibration or the previous calibration better represents the sensor condition during deployment. In SEASOFT enter the chosen coefficients. The coefficient 'slope' allows small corrections for drift between calibrations (consult the SEASOFT manual). Calibration coefficients obtained after a repair or cleaning apply only to subsequent data.

'AS RECEIVED CALIBRATION'

☑ Performed ☐ Not Performed

Date: 12/17/2011

Drift since last cal: -0.00040 PSU/month*

Comments:

'CALIBRATION AFTER CLEANING & REPLATINIZING'

☐ Performed ☑ Not Performed

Date:

Drift since Last cal: PSU/month*

Comments:

**Measured at 3.0 S/m*

Cell cleaning and electrode replatinizing tend to 'reset' the conductivity sensor to its original condition. Lack of drift in post-cleaning-calibration indicates geometric stability of the cell and electrical stability of the sensor circuit.

CTD - 6667, S222 (Spare)

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Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 6667
CALIBRATION DATE: 17-Dec-11

SBE19plus TEMPERATURE CALIBRATION DATA
ITS-90 TEMPERATURE SCALE

ITS-90 COEFFICIENTS

a0 = 1.246547e-003
a1 = 2.596044e-004
a2 = -1.637414e-007
a3 = 1.445447e-007

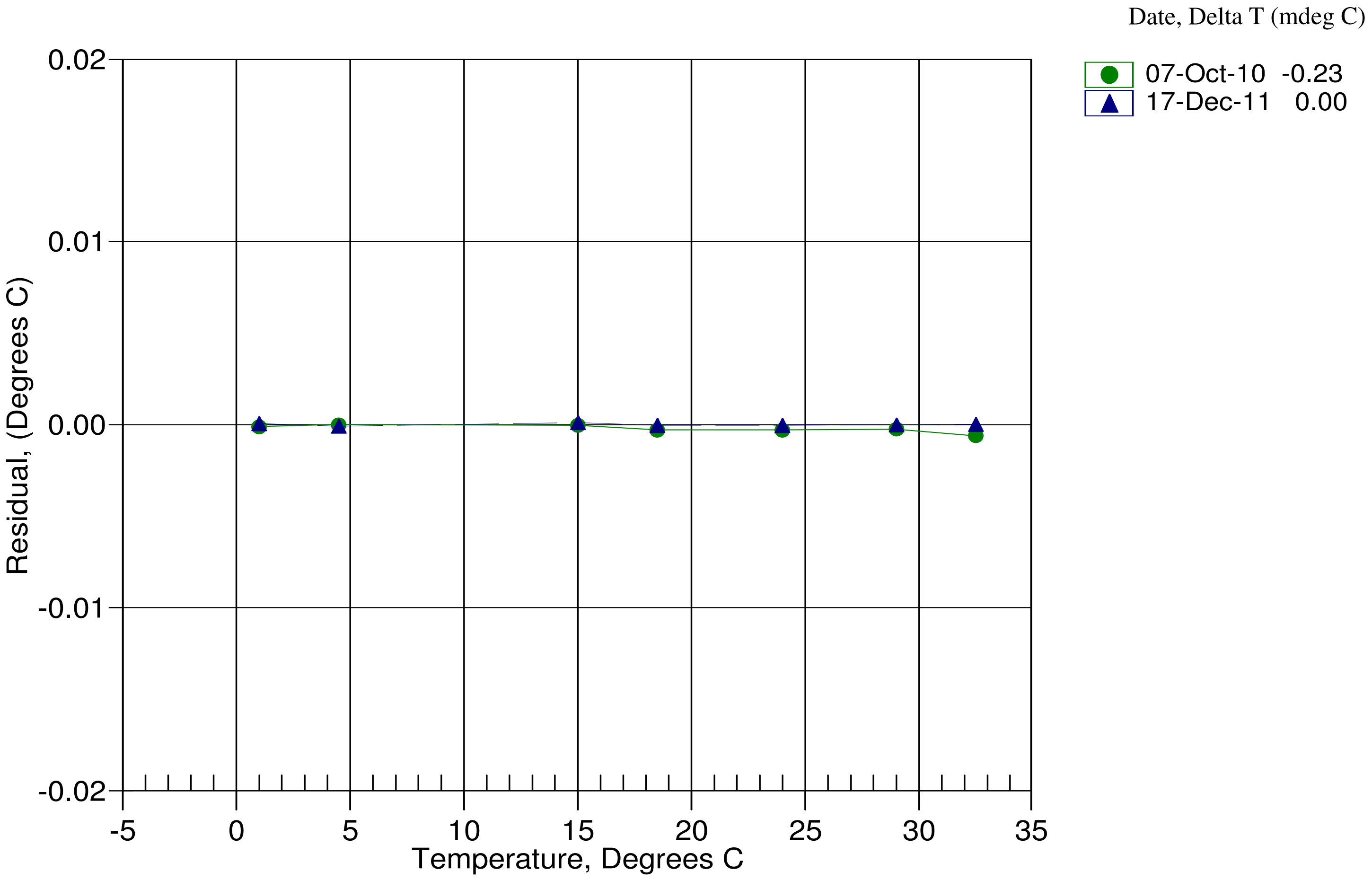
BATH TEMP (ITS-90)	INSTRUMENT OUTPUT(n)	INST TEMP (ITS-90)	RESIDUAL (ITS-90)
1.0000	702135.237	1.0000	0.0000
4.5000	626313.390	4.4999	-0.0001
15.0000	435058.390	15.0001	0.0001
18.5000	383024.458	18.5000	-0.0000
24.0000	311973.034	24.0000	-0.0000
29.0000	257611.085	29.0000	-0.0000
32.5000	224677.186	32.5000	0.0000

$MV = (n - 524288) / 1.6e+007$

$R = (MV * 2.900e+009 + 1.024e+008) / (2.048e+004 - MV * 2.0e+005)$

$\text{Temperature ITS-90} = 1/\{a0 + a1[ln(R)] + a2[ln^2(R)] + a3[ln^3(R)]\} - 273.15$ (°C)

Residual = instrument temperature - bath temperature



CTD - 6667, S222 (Spare)

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SENSOR SERIAL NUMBER: 6667
CALIBRATION DATE: 16-Dec-11

SBE19plus PRESSURE CALIBRATION DATA
870 psia S/N 3182130

COEFFICIENTS:

PA0 = 1.879247e+000
PA1 = 2.627187e-003
PA2 = 2.286017e-011
PTEMPA0 = -6.545655e+001
PTEMPA1 = 5.168516e+001
PTEMPA2 = -2.587175e-001

PTCA0 = 5.246270e+005
PTCA1 = 5.088441e+001
PTCA2 = -8.235602e-001
PTCB0 = 2.523813e+001
PTCB1 = -9.750000e-004
PTCB2 = 0.000000e+000

PRESSURE SPAN CALIBRATION

PRESSURE PSIA	INST OUTPUT	THERMISTOR OUTPUT	COMPUTED PRESSURE	ERROR %FSR
14.84	530261.0	1.7	14.83	-0.00
180.11	593057.0	1.7	180.04	-0.01
360.09	661395.0	1.7	360.04	-0.01
540.09	729655.0	1.7	540.05	-0.00
720.08	797831.0	1.7	720.06	-0.00
875.05	856461.0	1.7	875.03	-0.00
720.09	797862.0	1.7	720.14	0.01
540.12	729700.0	1.7	540.17	0.01
360.13	661450.0	1.7	360.18	0.01
180.16	593116.0	1.7	180.19	0.00
14.84	530287.0	1.7	14.88	0.00

THERMAL CORRECTION

TEMP ITS90	THERMISTOR OUTPUT	INST OUTPUT
32.50	1.91	530505.78
29.00	1.84	530493.60
24.00	1.75	530456.86
18.50	1.64	530377.95
15.00	1.57	530299.18
4.50	1.36	529927.18
1.00	1.29	529765.53

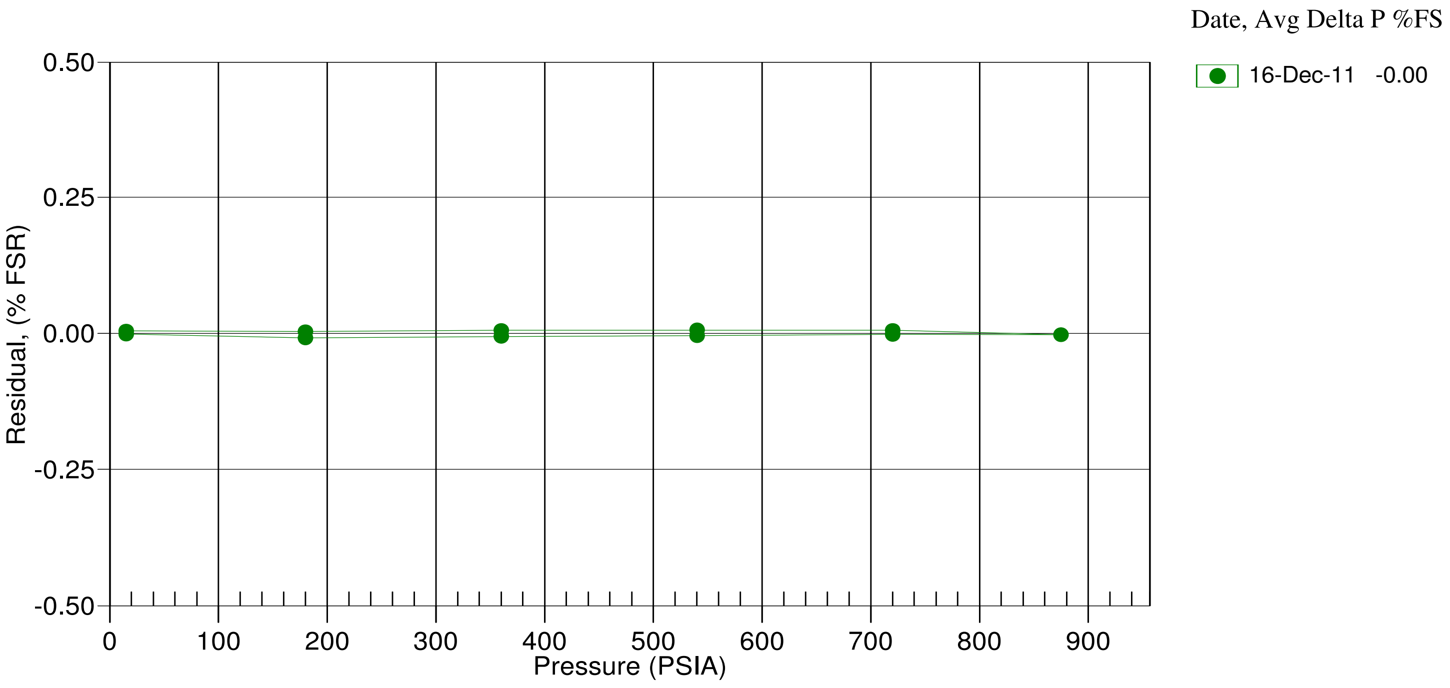
TEMP(ITS90)	SPAN(mV)
-5.00	25.24
35.00	25.20

y = thermistor output; $t = PTEMPA0 + PTEMPA1 * y + PTEMPA2 * y^2$

$x = \text{pressure output} - PTCA0 - PTCA1 * t - PTCA2 * t^2$

$n = x * PTCB0 / (PTCB0 + PTCB1 * t + PTCB2 * t^2)$

$\text{pressure (psia)} = PA0 + PA1 * n + PA2 * n^2$



CTD - 6667, S222 (Spare)

Sea-Bird Electronics, Inc.
13431 NE 20th Street, Bellevue, WA 98005-2010 USA
Phone: (+1) 425-643-9866 Fax (+1) 425-643-9954 Email: seabird@seabird.com

SENSOR SERIAL NUMBER: 6667
CALIBRATION DATE: 17-Dec-11

SBE19plus CONDUCTIVITY CALIBRATION DATA
PSS 1978: C(35,15,0) = 4.2914 Siemens/meter

COEFFICIENTS:

```
g = -1.025366e+000
h =  1.349556e-001
i = -1.862922e-004
j =  3.127232e-005
```

```
CPcor = -9.5700e-008
CTcor =  3.2500e-006
```

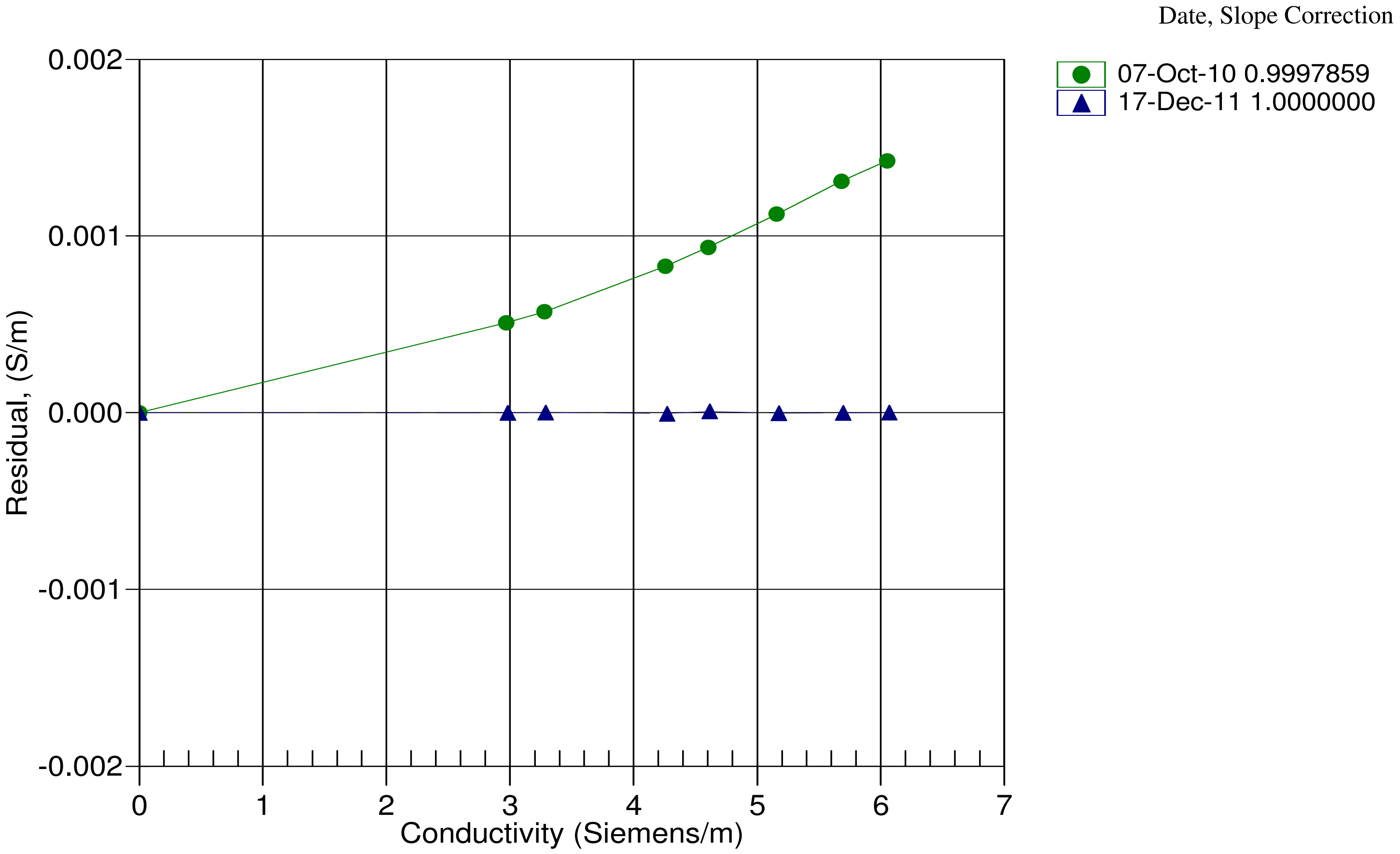
BATH TEMP (ITS-90)	BATH SAL (PSU)	BATH COND (Siemens/m)	INST FREQ (Hz)	INST COND (Siemens/m)	RESIDUAL (Siemens/m)
22.0000	0.0000	0.00000	2759.23	0.0000	0.00000
1.0000	34.8691	2.98005	5449.64	2.9800	-0.00000
4.5000	34.8488	3.28749	5654.26	3.2875	0.00000
15.0000	34.8046	4.27033	6262.94	4.2703	-0.00001
18.5000	34.7944	4.61578	6463.01	4.6158	0.00001
24.0000	34.7824	5.17414	6773.59	5.1741	-0.00000
29.0000	34.7727	5.69598	7051.19	5.6960	-0.00000
32.5000	34.7626	6.06768	7242.24	6.0677	0.00000

f = INST FREQ / 1000.0

Conductivity = $(g + hf^2 + if^3 + jf^4) / (1 + \delta t + \varepsilon p)$ Siemens/meter

t = temperature[°C)]; p = pressure[decibars]; δ = CTcor; ε = CPcor;

Residual = instrument conductivity - bath conductivity



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Certificate of Calibration

Customer: NOAA - Marine Operations Center Atlantic
Asset Serial Number: 004823
Asset Product Type: Smart SV&T
Calibration Type: Temperature
Calibration Range: 0 to +45 Deg C
Calibration RMS Error: .005
Calibration ID: 004823 999999 T12501 271211 215522
Installed On:

Coefficient A: -4.619904E+1
Coefficient B: 2.879730E-3
Coefficient C: -4.674987E-8
Coefficient D: 4.785235E-13
Coefficient E: 0.000000E+0
Coefficient F: 0.000000E+0

Coefficient G: 0.000000E+0
Coefficient H: 0.000000E+0
Coefficient I: 0.000000E+0
Coefficient J: 0.000000E+0
Coefficient K: 0.000000E+0
Coefficient L: 0.000000E+0
Coefficient M: 0.000000E+0

Calibration Date (dd/mm/yyyy): 27/12/2011
Certified By:

Robert Haydock
President, AML Oceanographic

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SSVS - S222

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Certificate of Calibration

Customer: NOAA - Marine Operations Center Atlantic
Asset Serial Number: 004823
Asset Product Type: Smart SV&T
Calibration Type: Sound Velocity
Calibration Range: 1400 to 1550 m/s
Calibration RMS Error: .0207
Calibration ID: 004823 999999 139875 271211 215522
Installed On:

Coefficient A: 1.524980E+3
Coefficient B: -1.067510E+2
Coefficient C: 8.551027E+0
Coefficient D: -8.853014E-1
Coefficient E: 0.000000E+0
Coefficient F: 0.000000E+0

Coefficient G: 0.000000E+0
Coefficient H: 0.000000E+0
Coefficient I: 0.000000E+0
Coefficient J: 0.000000E+0
Coefficient K: 0.000000E+0
Coefficient L: 0.000000E+0
Coefficient M: 0.000000E+0

Calibration Date (dd/mm/yyyy): 27/12/2011
Certified By:

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President, AML Oceanographic

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Certificate of Calibration

Customer: NOAA - Marine Operations Center Atlantic
Asset Serial Number: 005649
Asset Product Type: Smart SV&T Instrument, 500m Housing
Calibration Type: Temperature
Calibration Range: 0 to +45 Deg C
Calibration RMS Error: .0003
Calibration ID: 005649 002099 400180 291211 162040
Installed On:

Coefficient A: -1.681698E+1
Coefficient B: 1.539978E-3
Coefficient C: -2.610716E-8
Coefficient D: 4.938888E-13
Coefficient E: -4.346158E-18
Coefficient F: 8.910081E-24
Coefficient G: 1.479443E-28
Coefficient H: 0.000000E+0
Coefficient I: 0.000000E+0
Coefficient J: 0.000000E+0
Coefficient K: 0.000000E+0
Coefficient L: 0.000000E+0
Coefficient M: 0.000000E+0

Calibration Date (dd/mm/yyyy): 29/12/2011
Certified By:

Robert Haydock
President, AML Oceanographic

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Certificate of Calibration

Customer: NOAA - Marine Operations Center Atlantic
Asset Serial Number: 005649
Asset Product Type: Smart SV&T Instrument, 500m Housing
Calibration Type: Sound Velocity
Calibration Range: 1400 to 1600 m/s
Calibration RMS Error: .0144
Calibration ID: 005649 002051 200506 271211 215522
Installed On:

Coefficient A: 7.232283E-4
Coefficient B: -7.385191E-5
Coefficient C: 6.647626E-7
Coefficient D: -5.091818E-7
Coefficient E: 0.000000E+0
Coefficient F: 0.000000E+0

Coefficient G: 0.000000E+0
Coefficient H: 0.000000E+0
Coefficient I: 0.000000E+0
Coefficient J: 0.000000E+0
Coefficient K: 0.000000E+0
Coefficient L: 0.000000E+0
Coefficient M: 0.000000E+0

Calibration Date (dd/mm/yyyy): 27/12/2011
Certified By:

Robert Haydock
President, AML Oceanographic

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MVP, S222

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Certificate of Calibration

Customer: NOAA - Marine Operations Center Atlantic
Asset Serial Number: 007591
Asset Product Type: Micro SV&P for Brooke MVP -
Calibration Type: Sound Velocity
Calibration Range: 1400 to 1600 m/s
Calibration RMS Error: .0112
Calibration ID: 007591 131945 135084 081211 094606
Installed On:

Coefficient A: 7.186194E-4
Coefficient B: -7.417913E-5
Coefficient C: 1.163344E-6
Coefficient D: -7.809832E-7
Coefficient E: 0.000000E+0
Coefficient F: 0.000000E+0

Coefficient G: 0.000000E+0
Coefficient H: 0.000000E+0
Coefficient I: 0.000000E+0
Coefficient J: 0.000000E+0
Coefficient K: 0.000000E+0
Coefficient L: 0.000000E+0
Coefficient M: 0.000000E+0

Calibration Date (dd/mm/yyyy): 8/12/2011
Certified By:

Robert Haydock
President, AML Oceanographic

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Certificate of Calibration

Customer: NOAA - Marine Operations Center Atlantic
Asset Serial Number: 007591
Asset Product Type: Micro SV&P for Brooke MVP -
Calibration Type: Pressure
Calibration Range: 1000 dBar
Calibration RMS Error: .0488
Calibration ID: 007591 129146 0TE599 291211 154038
Installed On:

Coefficient A: -2.575685E+3
Coefficient B: 1.820538E-1
Coefficient C: -4.133096E-6
Coefficient D: 2.932489E-11
Coefficient E: 5.711699E-1
Coefficient F: -3.660197E-5

Coefficient G: 8.071607E-10
Coefficient H: -5.916234E-15
Coefficient I: -1.762695E-5
Coefficient J: 1.123850E-9
Coefficient K: -2.388330E-14
Coefficient L: 1.691618E-19
Coefficient M: 0.000000E+0

Calibration Date (dd/mm/yyyy): 29/12/2011
Certified By:

Robert Haydock
President, AML Oceanographic

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Certificate of Calibration

Customer: NOAA - Marine Operations Center Atlantic
Asset Serial Number: 005340
Asset Product Type: Smart SV&P for Brooke MVP -
Calibration Type: Sound Velocity
Calibration Range: 1400 to 1550 m/s
Calibration RMS Error: .0162
Calibration ID: 005340 999999 201222 071211 215548
Installed On:

Coefficient A: 1.523393E+3
Coefficient B: -1.069210E+2
Coefficient C: 8.466070E+0
Coefficient D: -7.911434E-1
Coefficient E: 0.000000E+0
Coefficient F: 0.000000E+0

Coefficient G: 0.000000E+0
Coefficient H: 0.000000E+0
Coefficient I: 0.000000E+0
Coefficient J: 0.000000E+0
Coefficient K: 0.000000E+0
Coefficient L: 0.000000E+0
Coefficient M: 0.000000E+0

Calibration Date (dd/mm/yyyy): 7/12/2011
Certified By:

Robert Haydock
President, AML Oceanographic

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MVP, S222

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Certificate of Calibration

Customer: NOAA - Marine Operations Center Atlantic
Asset Serial Number: 005340
Asset Product Type: Smart SV&P for Brooke MVP -
Calibration Type: Pressure
Calibration Range: 1000 dBar
Calibration RMS Error: .0293
Calibration ID: 005340 999999 0ZE092 281211 133158
Installed On:

Coefficient A: -1.918390E+3
Coefficient B: -1.399663E+0
Coefficient C: 2.217375E-2
Coefficient D: -1.520440E-4
Coefficient E: 5.850883E-2
Coefficient F: 4.658058E-5

Coefficient G: -9.419392E-7
Coefficient H: 1.044152E-8
Coefficient I: 1.180306E-8
Coefficient J: -1.508418E-10
Coefficient K: 8.793572E-12
Coefficient L: -1.896560E-13
Coefficient M: 0.000000E+0

Calibration Date (dd/mm/yyyy): 28/12/2011
Certified By:

Robert Haydock
President, AML Oceanographic

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RESON

SVP Test and Calibration certificate

SVP Type :	SVP70
SVP Serial No.	2011275

Date of issue :	29-09-2011

Temperature Calibration :	Hart 1504 s/n A6B554 & Thermistor s/n 3014
Point 1:	4.6 °C
Point 2:	16.6 °C
Point 3:	25.5 °C
Pressure Calibration :	Custom Built Tank (TestUnit ASF150 Ser# 41-10-0007-R03)
Point 1:	0 Bar
Point 2:	299.7 Bar
Point 3:	600.4 Bar

	RMS Speed of Sound Errors
Temperature Validation :	0.0029 m/s
Pressure Validation :	0.0710 m/s

Calibration & Final Function Test : Sign :

QA Signature : Inits :

2011.09.29

RESON

RESON A/S, Fabriksvangen 13, DK-3550 Slangerup
Fax: +45 4738 0066, Phone: +45 4738 0022

SVP Test and Calibration certificate

SVP Type :	SVP71
SVP Serial No.	4211067

Date of issue : 22-02-2012

Temperature Calibration :	Hart 1504 s/n A6B554 & Thermistor s/n 3014
Point 1:	4.6 °C
Point 2:	16.5 °C
Point 3:	25.5 °C
Pressure Calibration :	Custom Built Tank (TestUnit ASF150 Ser# 41-10-0007-R03)
Point 1:	0 Bar
Point 2:	103.3 Bar
Point 3:	204.2 Bar

	RMS Speed of Sound Errors
Temperature Validation :	0.0156 m/s
Pressure Validation :	0.0241 m/s

Calibration & Final Function Test : Sign : Find Petersen

QA Signature : Inits :

2012.02.23

RESON A/S, Fabriksvangen 13, DK-3550 Slangerup
Fax: +45 4738 0066, Phone: +45 4738 0022

SVP Test and Calibration certificate

SVP Type :	SVP71
SVP Serial No.	4211065

Date of issue : 21-02-2012

Temperature Calibration :	Hart 1504 s/n A6B554 & Thermistor s/n 3014
Point 1:	4.6 °C
Point 2:	16.5 °C
Point 3:	25.5 °C
Pressure Calibration :	Custom Built Tank (TestUnit ASF150 Ser# 41-10-0007-R03)
Point 1:	0 Bar
Point 2:	102.5 Bar
Point 3:	203.9 Bar

	RMS Speed of Sound Errors
Temperature Validation :	0.0231 m/s
Pressure Validation :	0.0713 m/s

Calibration & Final Function Test : Sign : Find Petersen

QA Signature : Inits :

2012.02.23

RESON A/S, Fabriksvangen 13, DK-3550 Slangerup
Fax: +45 4738 0066, Phone: +45 4738 0022

RESON

SVP Test and Calibration certificate

SVP Type :	SVP71
SVP Serial No.	0710064

Date of issue :	14-09-2011

Temperature Calibration :	**Hart 1504 s/n A6B554 & Thermistor s/n 3014**
Point 1:	4.6 °C
Point 2:	16.6 °C
Point 3:	25.5 °C
Pressure Calibration :	**Custom Built Tank (TestUnit ASF150 Ser# 41-10-0007-R03)**
Point 1:	0 Bar
Point 2:	101.4 Bar
Point 3:	204.1 Bar

	RMS Speed of Sound Errors
Temperature Validation :	**0.0185 m/s**
Pressure Validation :	**0.0766 m/s**

Calibration & Final Function Test : Sign : Finn Petersen

QA Signature : Inits :

RESON 3

2011.09.14

RESON

RESON A/S, Fabriksvangen 13, DK-3550 Slangerup
Fax: +45 4738 0066, Phone: +45 4738 0022

H12488

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12488

LOCALITY

State(s):	New York
General Locality:	Long Island Sound
Sub-locality:	East of Nissequuge River to Crane Neck Point NY.

2012

CHIEF OF PARTY
CDR. Lawerence T. Krepp, NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H12488

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**New York**
General Locality:	**Long Island Sound**
Sub-Locality:	**East of Nissequuge River to Crane Neck Point NY.**
Scale:	**10000**
Dates of Survey:	**06/24/2012 to 08/02/2012**
Instructions Dated:	**05/08/2012**
Project Number:	**OPR-B340-TJ-12**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**CDR. Lawerence T. Krepp, NOAA**
Soundings by:	**RESON 7125 Multibeam Echo Sounder**
Imagery by:	**RESON 7125 Backscatter KLEIN 5000 Side Scan Sonar**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

Table of Contents

List of Tables

List of Figures

Descriptive Report to Accompany Survey H12488

Project: OPR-B340-TJ-12
Locality: Long Island Sound
Sublocality: East of Nissequuge River to Crane Neck Point NY.
Scale: 1:10000
June 2012 - August 2012
NOAA Ship *Thomas Jefferson*
Chief of Party: CDR. Lawerence T. Krepp, NOAA

A. Area Surveyed

Area surveyed was east of Nissequogue River to Crane Neck Point New York. Crane Neck is a pennisula that extends out northwest into Long Island Sound. The submerged extension of the point continues with sandwaves and rocks that are susceptible to shoaling. On the south side of this survey is the approach to Stony Brook Harbor. It has considerable recreational and fishing charter enterprises.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
41° 1" 35' N 73° 12" 54' W	40° 54" 29' N 73° 8" 36' W

Table 1: Survey Limits

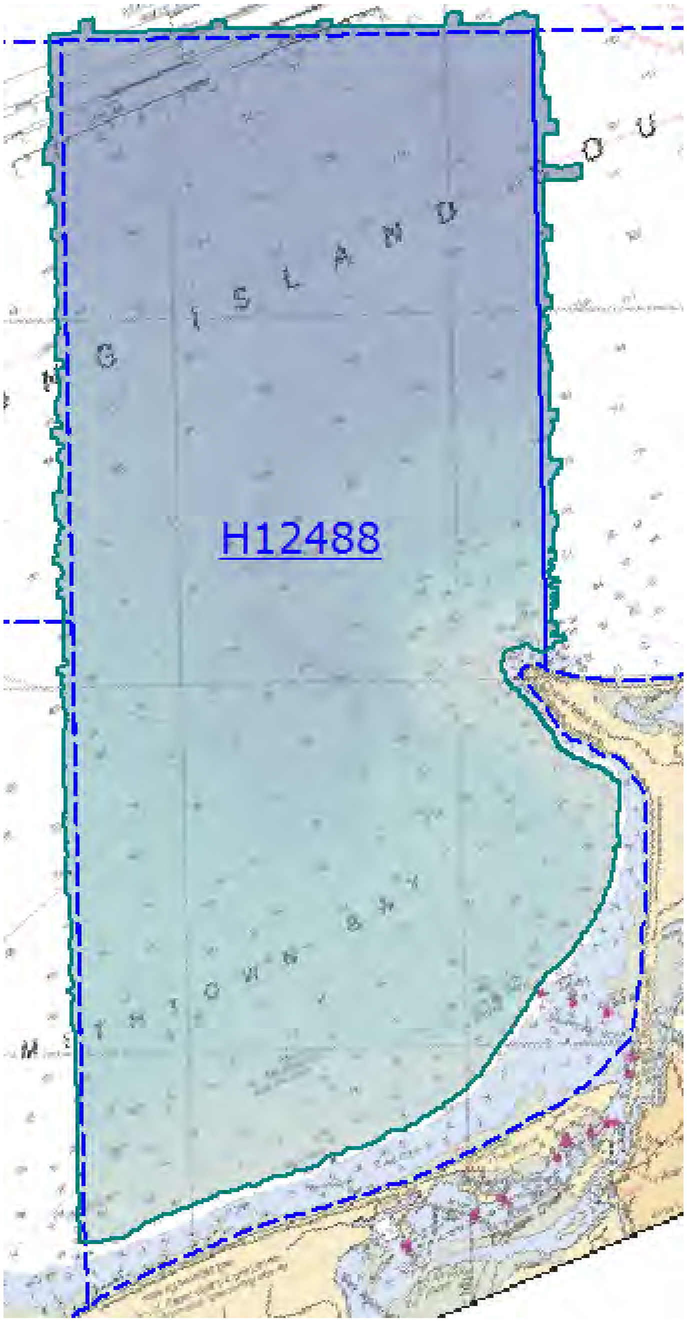


Figure 1: Limit to 4m Curve

Figure 2: Exception to 4m curve. Green to Yellow denotes 4m curve is obtained

The survey limits, as depicted in the project instructions project reference file, extend all the way to the shoreline. The coverage requirement for multibeam is to the NALL line or 4m curve. With the exception of foul areas, complete MBES coverage was achieved as per project instructions. These areas are generally located very near shore, subject to dangerous wave action, and judged to be navigationally insignificant. In Fig 4 the dashed line indicates the sheet limit, the solid line displays the limits of survey. Fig. 4 is a close up of missed areas.

A.2 Survey Purpose

This project is being conducted in support of NOAA's Office of Coast Survey to provide contemporary hydrographic data in order to update the nautical charting products and reduce the survey backlog within the area. In addition, data from this project will support the Long Island Sound Sea floor Mapping Initiative for the States of Connecticut and New York. This project also responds to the Coast Guard proposal to establish six anchorage grounds in Long Island Sound to increase safety for vessels through enhanced voyage planning and also by clearly indicating the location of anchorage grounds for ships proceeding to ports in New York. The USCG is requesting that NOAA confirm that their underwater surveys of Long Island Sound did not detect any wrecks at all in the locations being proposed for the anchorage areas. Data acquired for this project will be used by partners for species and habitat identification, infrastructure projects, ocean mapping, coastal hazards and geology. Partners include the US Environmental Protection Agency, Connecticut Department of Environmental Protection, the University of Connecticut Marine Science Department, New York Department of Environmental Quality, and other organizations.This project will cover approximately 206 SNM of which 165 SNM are critical survey areas as designated in the NOAA Hydrographic Survey Priorities, 2010 edition.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

Data acquired on survey H12488 met complete multibeam coverage requirements. Ninety five percent of the survey met the 5 soundings per node data density requirements outlined in section 5.2.2.2 of the HSSDM (Figure 2 and 3.). Most areas that did not meet the requirement were from acoustic shadows.

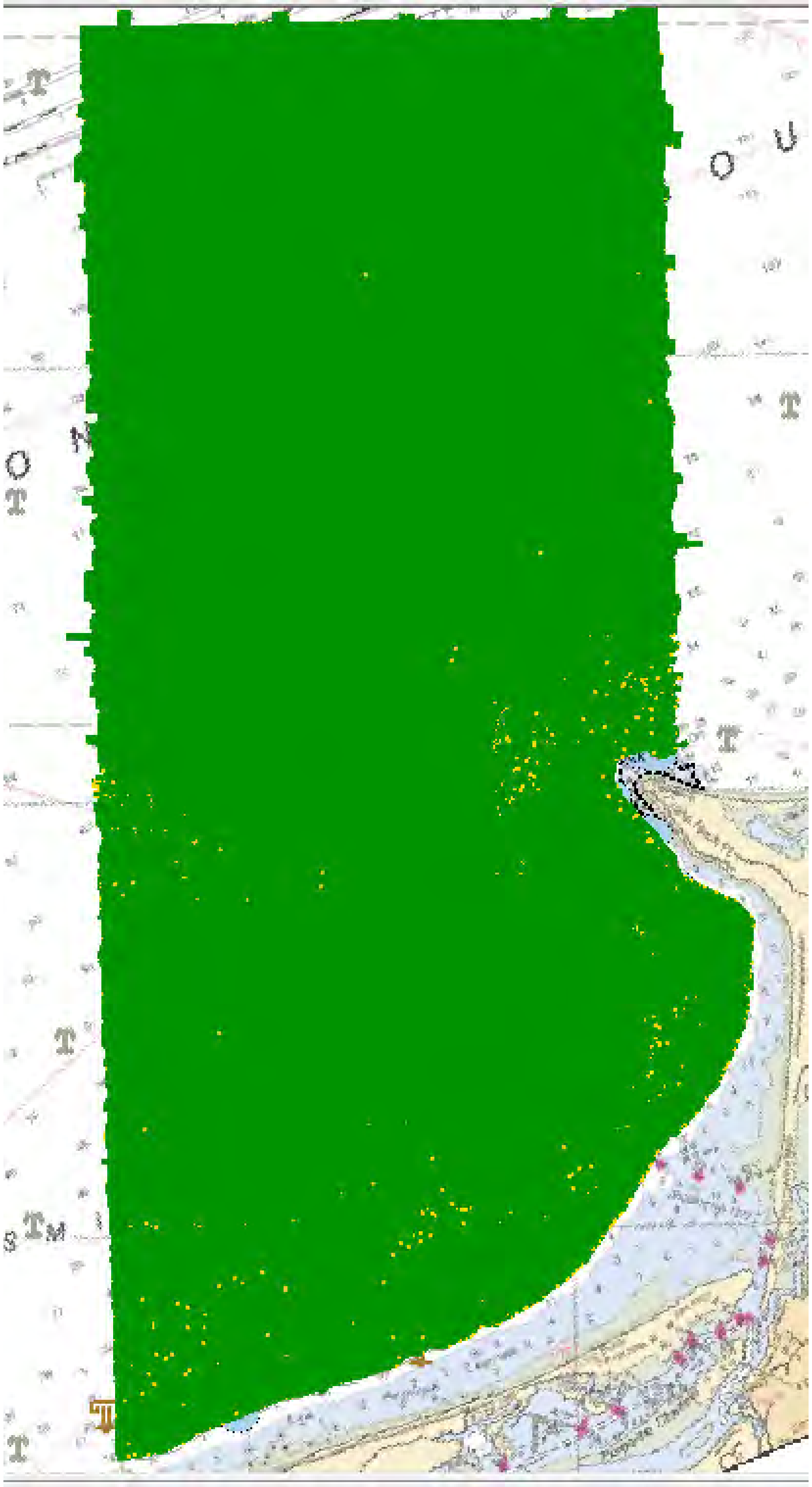
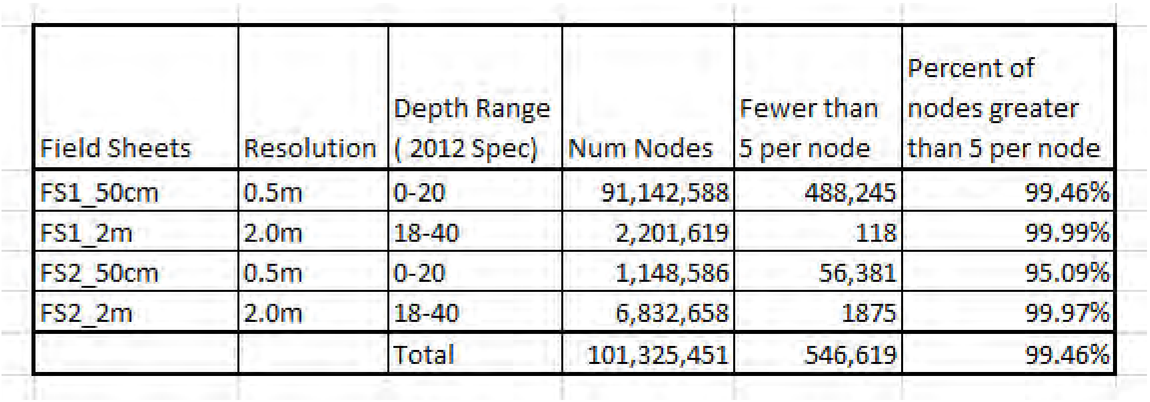


Figure 3: Total Coverage by Density Limit. Yellow indicates less than 5 pings per node



Field Sheets	Resolution	Depth Range (2012 Spec)	Num Nodes	Fewer than 5 per node	Percent of nodes greater than 5 per node
FS1_50cm	0.5m	0-20	91,142,588	488,245	99.46%
FS1_2m	2.0m	18-40	2,201,619	118	99.99%
FS2_50cm	0.5m	0-20	1,148,586	56,381	95.09%
FS2_2m	2.0m	18-40	6,832,658	1875	99.97%
		Total	101,325,451	546,619	99.46%

Figure 4: H12488 Density Summary Table

A.4 Survey Coverage

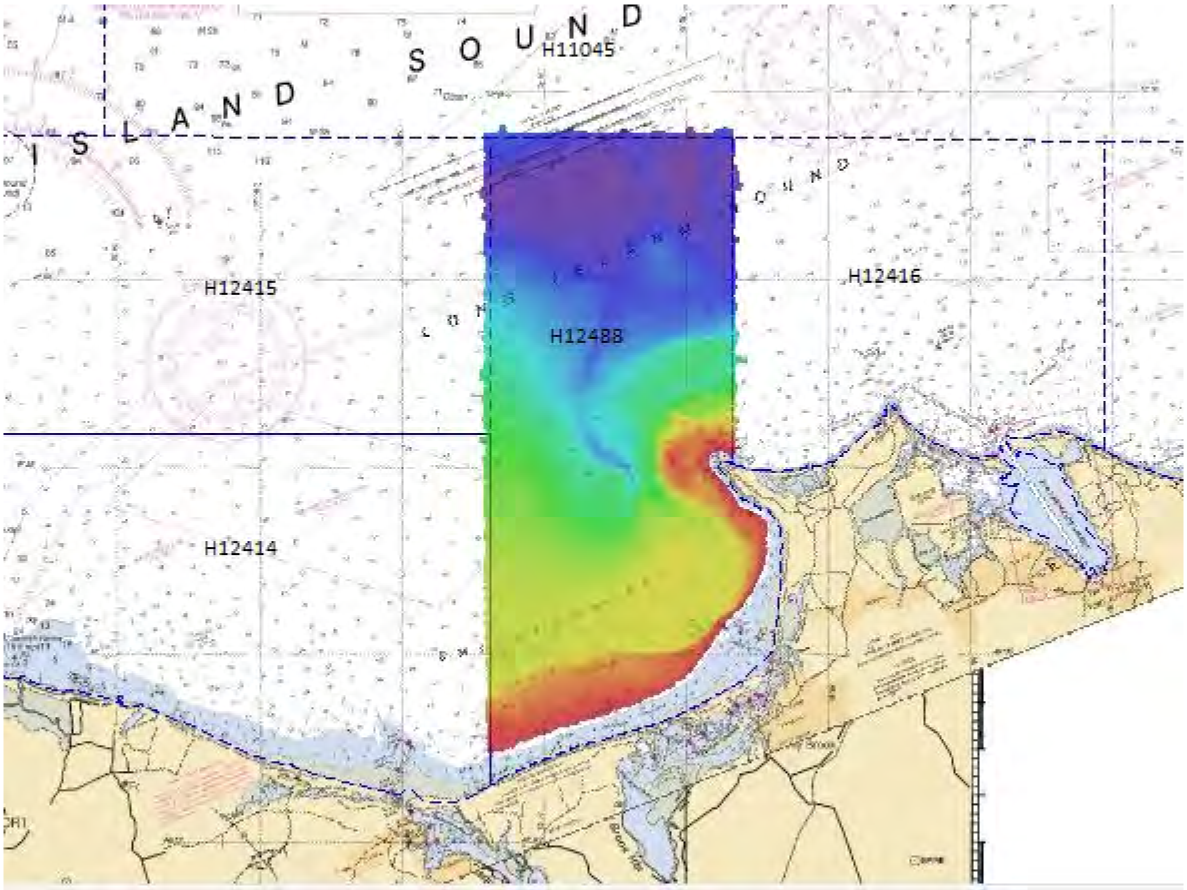


Figure 5: Survey Coverage Limit with contemporary adjoining Surveys

With the exception of Holidays and Density loss, over 95% of the survey adhered to the Project Instructions. Holidays that exceeded the 3 node specification were observed and noted in the image below. Some were of considerable length but usually not more than 2-3 nodes wide. There is a slight difference in the grid cell coverage depending on whether TCARI or GPS Tide is used. This may explain timeliness in accessing holiday plans prior to leaving the area. See Fig. 6

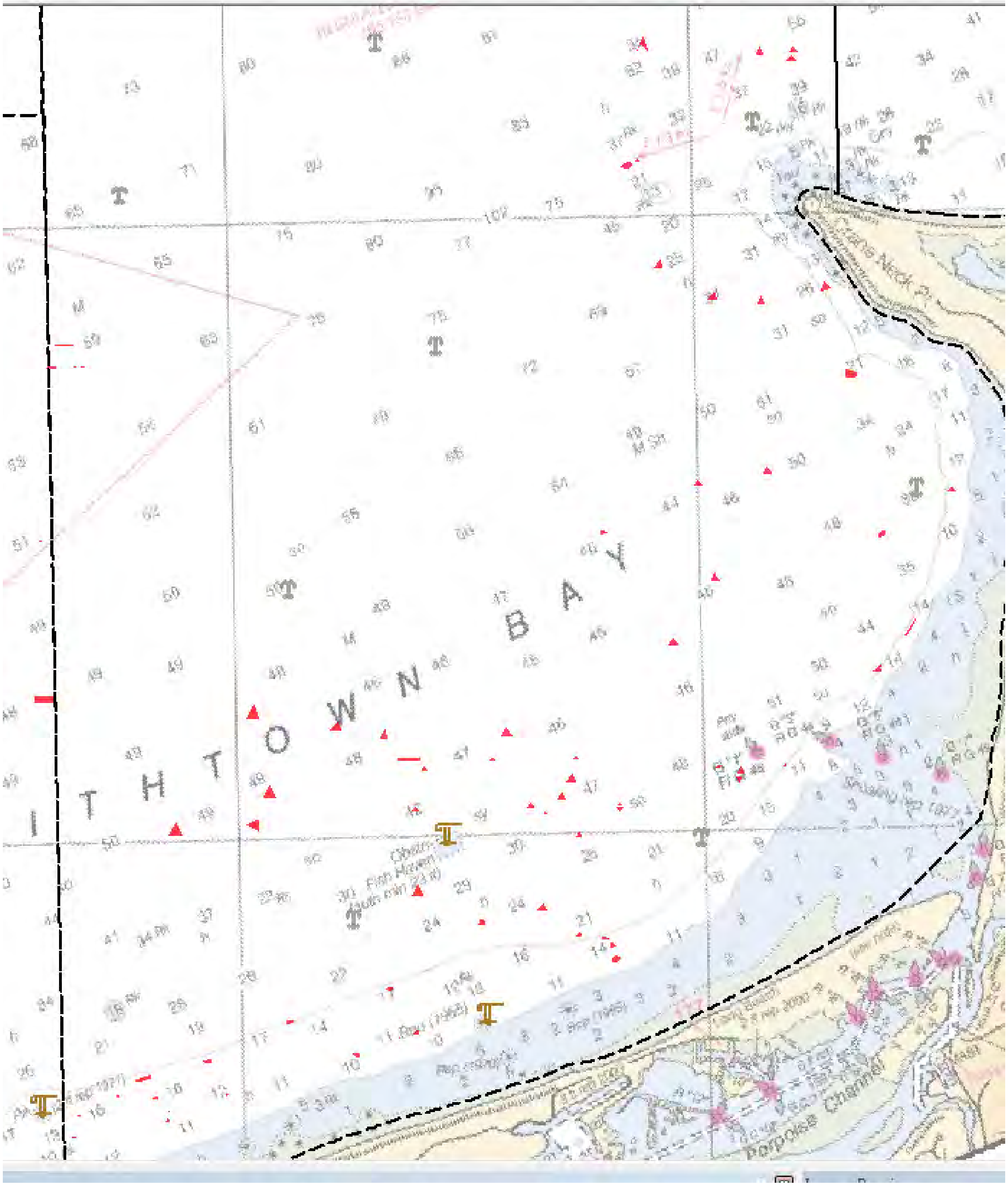


Figure 6: Areas of Holidays that exceed 3 consecutive pings.

A.5 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	Vessel	***S222***	***3101***	***3102***	***Total***
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	430.73	106.93	223.76	761.42
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	13.9	13.5	27.4
	SBES/MBES Combo Mainscheme	0	0	0	0
	SBES/SSS Combo Mainscheme	0	0	0	0
	MBES/SSS Combo Mainscheme	0	0.0	0	0
	SBES/MBES Combo Crosslines	22.41	22.79	21.43	66.63
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					0
Number AWOIS Items Investigated					4
Number Maritime Boundary Points Investigated					0
Number of DPs					2
Number of Items Items Investigated by Dive Ops					0
Total Number of SNM					16.6

Table 2: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates	Julian Day Number
06/24/2012	176
06/25/2012	177
06/26/2012	178
06/27/2012	179
06/28/2012	180
06/29/2012	181
06/30/2012	182
07/26/2012	208
07/27/2012	209
07/28/2012	210
07/29/2012	211
07/30/2012	212
08/02/2012	215

Table 3: Dates of Hydrography

Launches performed SSS only for Recon purposes.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***S222***	***3101***	***3102***
LOA	208 feet	31 feet	31 feet
Draft	15 feet	3.5 feet	3.5 feet

Table 4: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
RESON	7125 SV and 7125 ROV	MBES
KLEIN	5000 V1	SSS
APPLANIX	POS/MV	Attitude System
TRIMBLE	REC DSM212L	Positioning System
Rolls Royce	MVP	Sound Speed System
Seabird	SBE 19plus	Conductivity, Temperature, and Depth Sensor
Applied Micro System	Smart SV+T, Micro SV&P	Sound Speed System
RESON	SVP71	Sound Speed System

Table 5: Major Systems Used

B.2 Quality Control

B.2.1 Crosslines

Crosslines, acquired for this survey, totalled 9% of mainscheme acquisition.

The percentage of cross lines were 9% of the main scheme and exceeded the requirement for 100% object detection coverage. SSS was run only for reconnaissance and was not used to establish object detection requirements. A difference grid was made to access cross line to main scheme parity. Of the crossings 99% percent were less than +/- 0.3meters. Figures 7 and 8 show the cross line overlay on the main scheme lines. The boundary outlines the XL coverage. Statistics can be found in Separates IV.

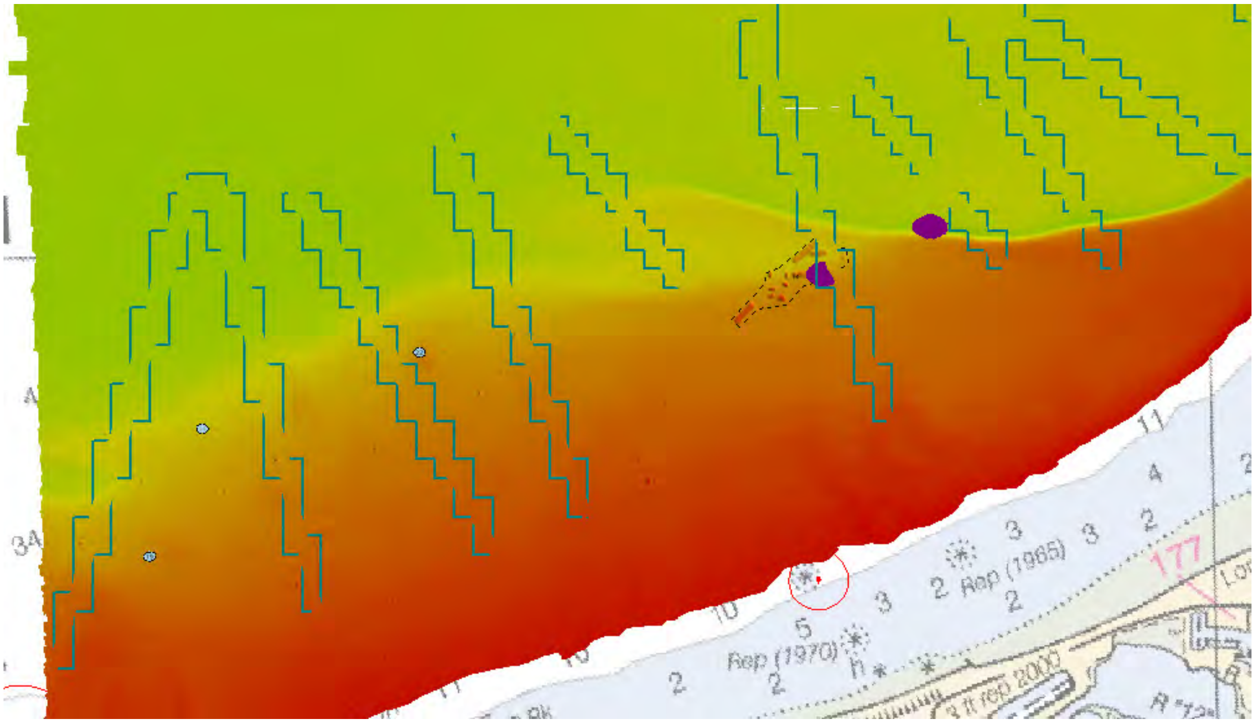


Figure 7: XL South. Orientations highlighted to show XL parity to MS

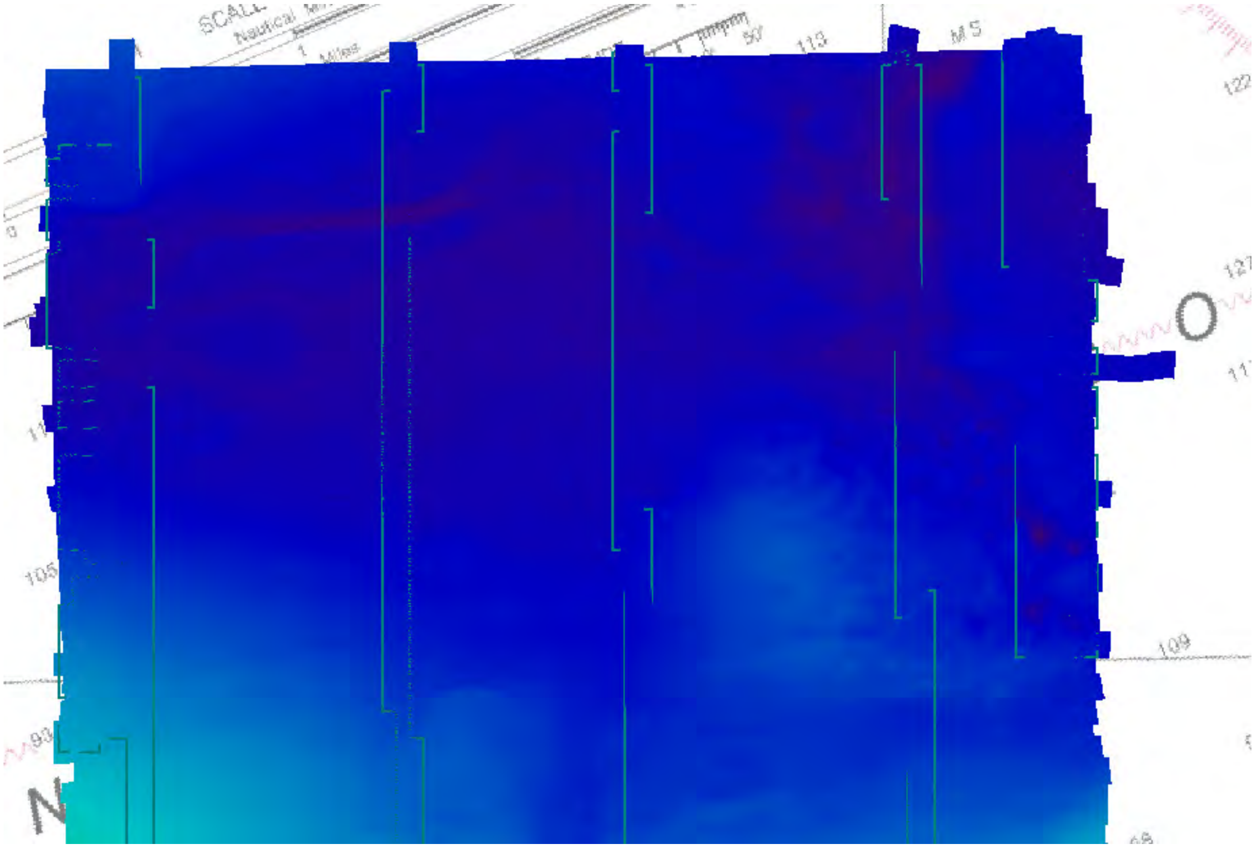


Figure 8: XL North. Orientations highlighted to show XL parity to MS

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0 meters	0 meters
0.102 meters	0 meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
3101 ,3102, S222	4.0 meters/second	0 meters/second	0.2 meters/second
S222	4.0 meters/second	1.0 meters/second	0.2 meters/second

Table 7: Survey Specific Sound Speed TPU Values

Two values for Tide uncertainty were used for this project. One is derived from Tidal Constituent And Residual Interpolation (TCARI), and the other Ellipsoidally Referenced Survey (ERS) and referred to as GPS Tide. A value of 0.102 was determined for GPS Tide. Two methods of sound velocity were also used derived from Conductivity Temperature and Density(CTD) and a Moving Vessel Profiler(MVP). The ship was the only platform that could use either CTD or MVP of which the MVP was the preferred method.

The NOAA uncertainty standards are based on IHO S-44 standards for hydrographic surveys. The TVU QC layer compares the estimated uncertainty of the depth estimate to the allowable uncertainty of the depth estimate node by node.The method used was the ratio method which visualizes the ratio of the uncertainty at a node to the maximum allowed IHO uncertainty for each node via a computed layer in CARIS. This TVU QC layer scales with depth and demonstrates what fraction of the total allowable error budget is consumed by the estimated uncertainty.

Four finalized surfaces were examined, H12488_FS1_50cm_MLLW, H12488_FS1_2m_MLLW, H12488_FS2_50cm_MLLW, H12488_FS2_2m_MLLW. Values from the ratio which require further examination are from -1.0 to -100. All the surfaces passed with 99.9% confidence. Most values were either on features or outliers of insignififcant value. Results can be found in Separates IV.

B.2.3 Junctions

There were three contemporary surveys that junction H12488. H12414 to the southwest, H12415 to the northwest, and H12416 to the east. The survey H11045 2003 by Rude was on the north side but no data was available. No other junction surveys provided intersected this survey. A difference surface was created between adjoining grids and results obtained from the statistic tool. All the junctions attained 99.8% agreement at less than +/- 0.3m. . Results can be found in Separates IV.

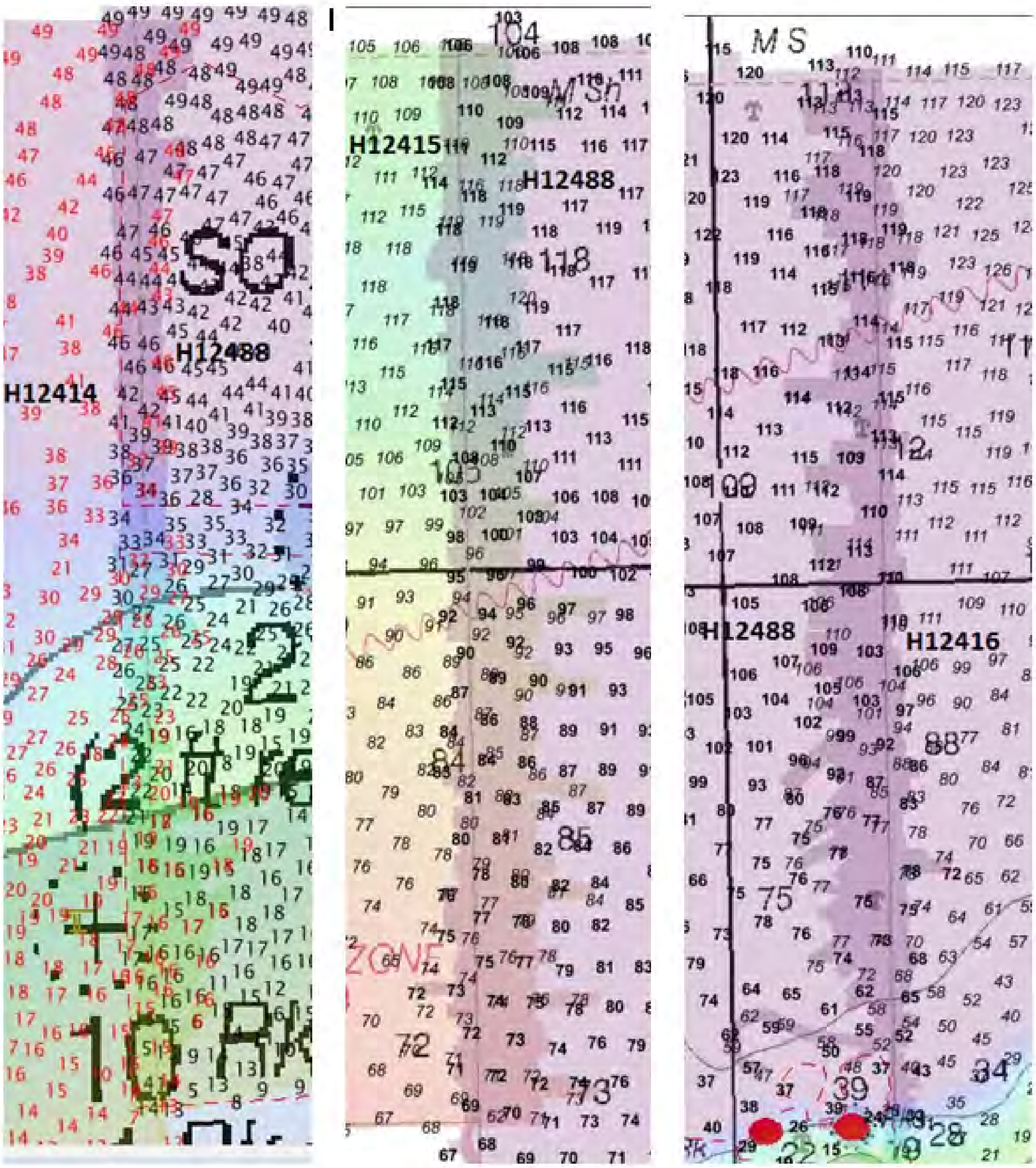


Figure 9: Contemporary Junctions with Surveys H12414, H12415, H12416

There are no contemporary surveys that junction with this survey.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: CTD Casts were taken every 3 to 4 hours throughout the day. MVP Casts averaged every 30 minutes depending on safe deployment or traffic.

Efforts to minimize sound velocity issues included frequent of casts based on time and location. While in acquisition, values in excess of 3 meters/sec while on line were monitored and decisions for casts determined on that basis.

In addition a Sound Speed Comparison Tool script developed by Matt Wilson was used on ship data. This tool will retroactively plot the real-time sound speed input to a multibeam echo sounder (SSP) versus the sound speed at the commensurate water level taken from the Moving Vessel Profiler (MVP). Out of 1007 MVP profiles for the ship, 13 comparisons failed the 2m/sec criteria on ship data. The 2m/sec criteria was chosen because the tool can better access the data then by monitoring it in acquistion. On inspection of the most excessive of the comparisons, data was either rejected completely or rejected to a reduced swath width(outside beams). Most excesses were within IHO specification for differences in depth caused by excess velocity error. The sample refers to a high reading from the results that occurred on S222 data DN181 at 2100. On inspection in subset editor the data was in fact within specification. The mean difference and standard deviation between surface and cast measurements was (m/s)=0.611, +/-0.927. See Fig. 11 and Separates H12488_Soundspeed_comarisons_All.txt for a list of times that were in excess.

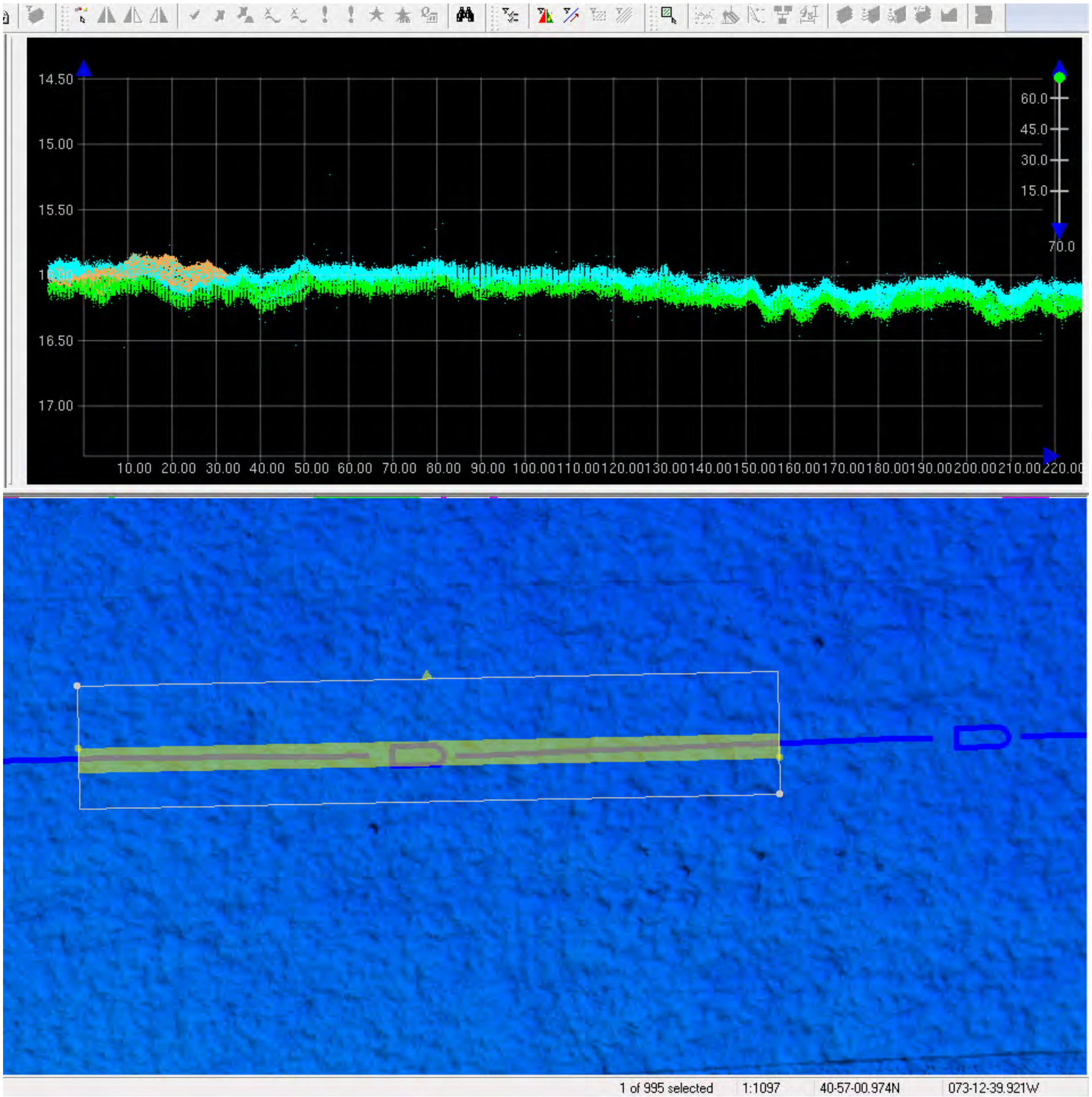


Figure 10: S222 DN181. Data Flagged by SSP tool in excess. Several lines are shown in addition to the line in error. All the lines have depths well within range.

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

All data reduction procedures conform to those detailed in the DAPR.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter was logged as a s7k file and submitted to the IOCM processing center and/or directly to NGDC, and is not included with the data submitted to the Branch.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: NOAA Profile V_5_3

The NOAAProfileField Version 5.3.2 was used for CARIS/HIPS and Bathy Data Base(BDB)

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12488_FS1_50cm_MLLW_Final	CUBE	0.5 meters	0 meters - 20 meters	NOAA_0.5m	Object Detection
H12488_FS1_2m_MLLW_Final	CUBE	2.0 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12488_FS2_50cm_MLLW_Final	CUBE	0.5 meters	0 meters - 20 meters	NOAA_0.5m	Object Detection
H12488_FS2_2m_MLLW_Final	CUBE	2 feet	18 meters -	NOAA_2m	Complete MBES

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
			40 meters		

Table 8: Submitted Surfaces

C. Vertical and Horizontal Control

The Hydrographer has no additional comments.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

<u>Standard Vertical Control Methods Used:</u>

TCARI

File Name	Status
8516945.tid	Final Approved
8467150.tid	Verified Observed
8465705.tid	Verified Observed

Table 9: Water Level Files (.tid)

File Name	Status
B340TJ2012_Rev.tc	Final

Table 10: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 08/10/2012. The final tide note was received on 10/10/2012.

Non-Standard Vertical Control Methods Used:

VDatum

Ellipsoid to Chart Datum Separation File:

The separation model for H12488 is 2012_B340_VDatum_Ellip_MLLW.txt and can be found in the GNSS, SBET directory.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The projection used for this project is UTM 18.

There were two differential beacons Moriches and Sandy Hook. Moriches was the beacon of choice and used predominantly on H12488.

The following DGPS Stations were used for horizontal control:

DGPS Stations
Moriches, NY 293 KHZ
Sandy Hook, NJ 286 KHZ

Table 11: USCG DGPS Stations

C.3 Additional Horizontal or Vertical Control Issues

3.3.1 GPS Tides and TCARI Application

The majority of this survey was processed with IAPPK ellipsoid heights, reduced to MLLW via a VDatum seperation file. Some lines after processing with GPS Tides, produced depths inconsistant with the rest of the mainschem multibeam and failed IHO specifications. The possible causes for those failures ranged from incomplete POSPAC data, operator error, system failure and anomalies due to satellite interference. Uncertainty and standard deviation layers of the grids were the best indication of major discrepancies. When alternative methods of processing in the POSPac MMS software failed, those lines were then processed using TCARI. If a small section of GPS Tide/Altitude was observed, that area was smoothed in the attitude editor. Care must be taken during application of correctors so the smoothing is not over written. A list of lines using TCARI can be found in Separates, I_Acquisition_&_Processing_Logs, Processing_Logs, H12488_SBET_QC_Log.xlsx. Examples of the anomalies are listed below.

Figure 11: Altitude Anomaly as viewed in Attitude Editor (GPS Tide). The green is displaying unsusal GPS Tide levels.

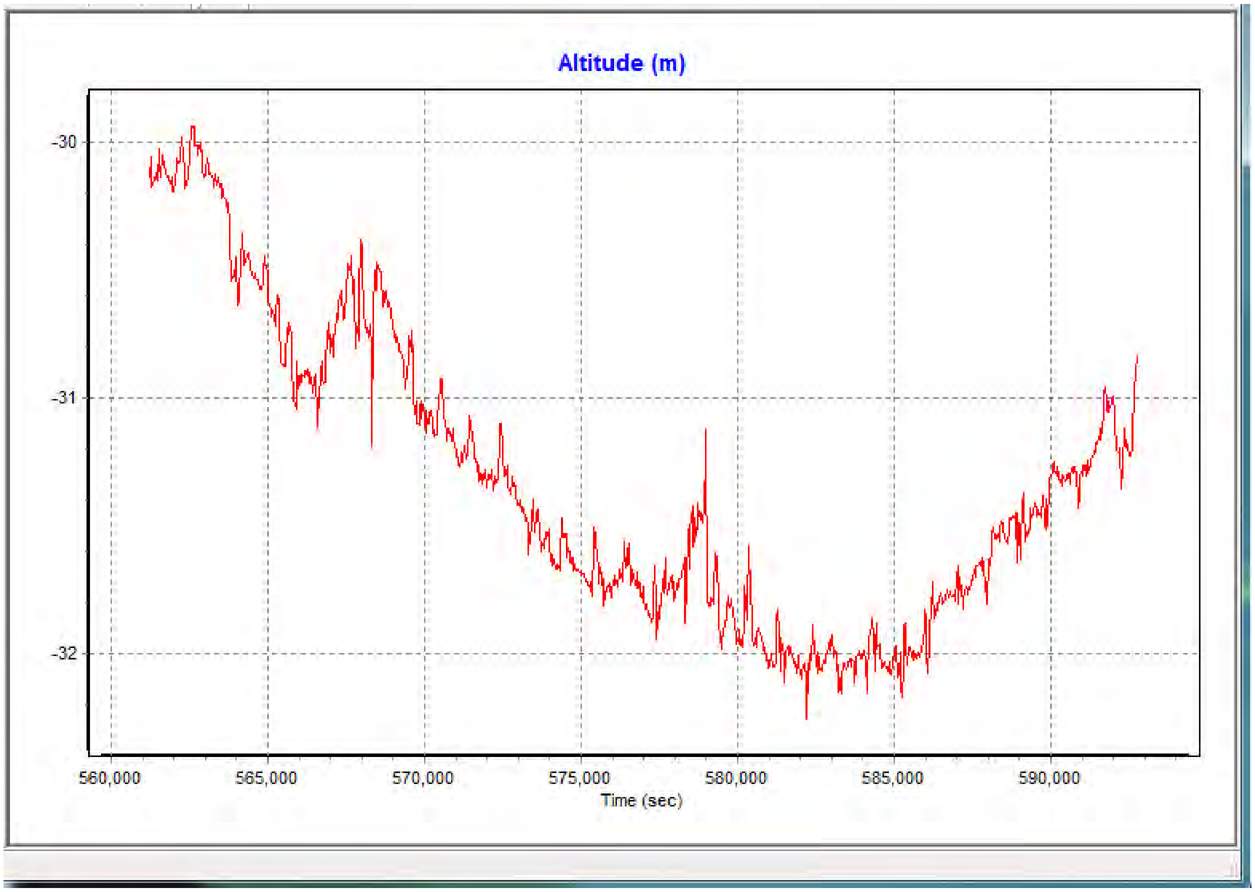
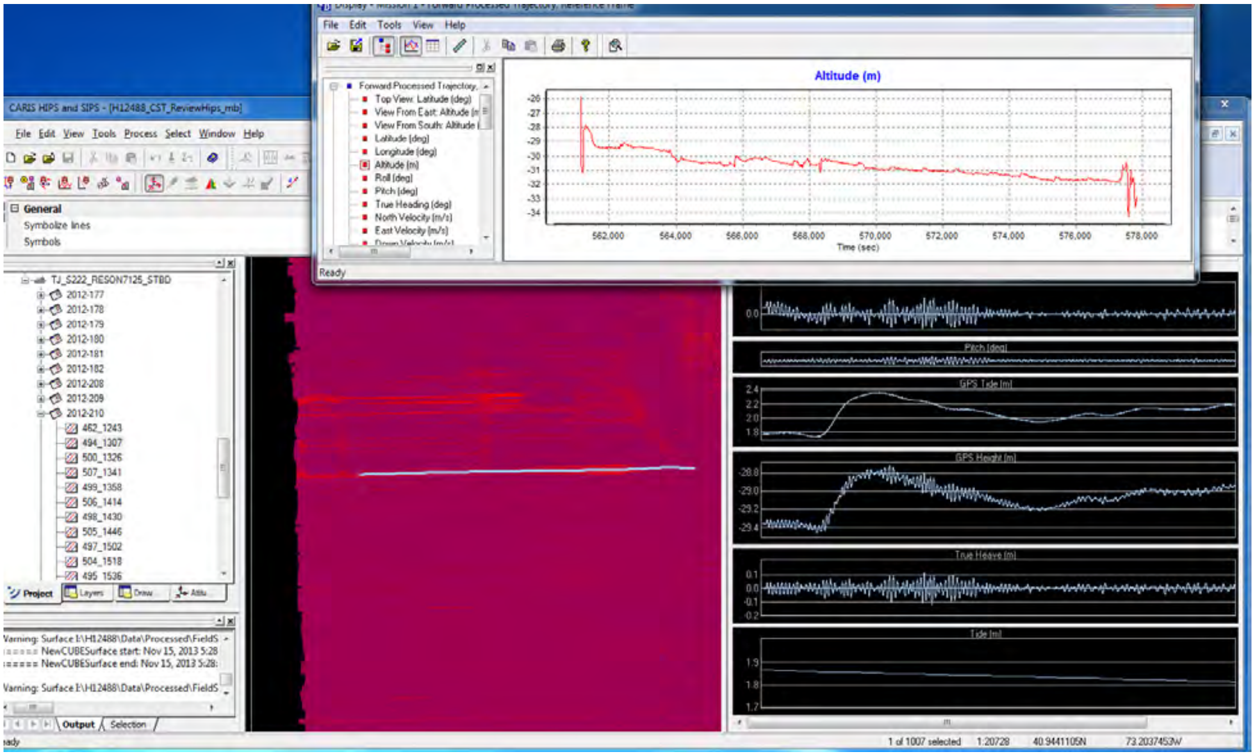


Figure 12: Altitude Anomaly POS/PAC MMS Altitude PLot



Warning: Surface I:\H12488\Data\Processed\FieldS
===== NewCUBESurface start: Nov 15, 2013 5:28
===== NewCUBESurface end: Nov 15, 2013 5:28:

Warning: Surface I:\H12488\Data\Processed\FieldS

Figure 13: Altitude Anomaly as viewed in Attitude Editor.
This compares GPS Tide and Height to TCARI Tide.

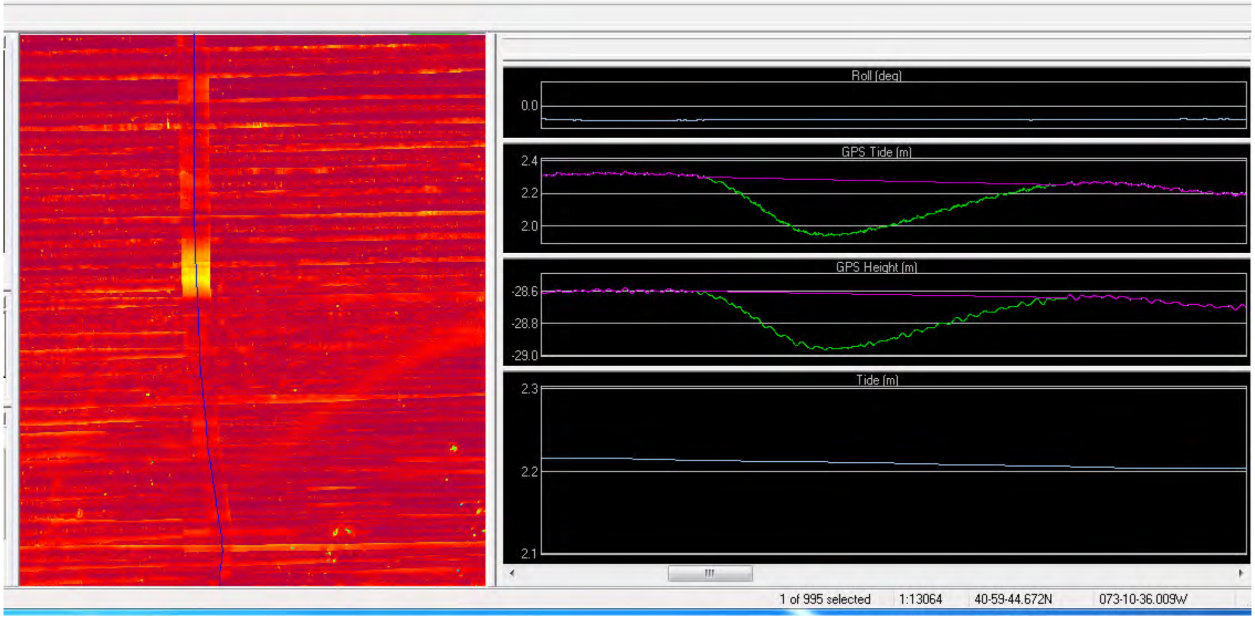
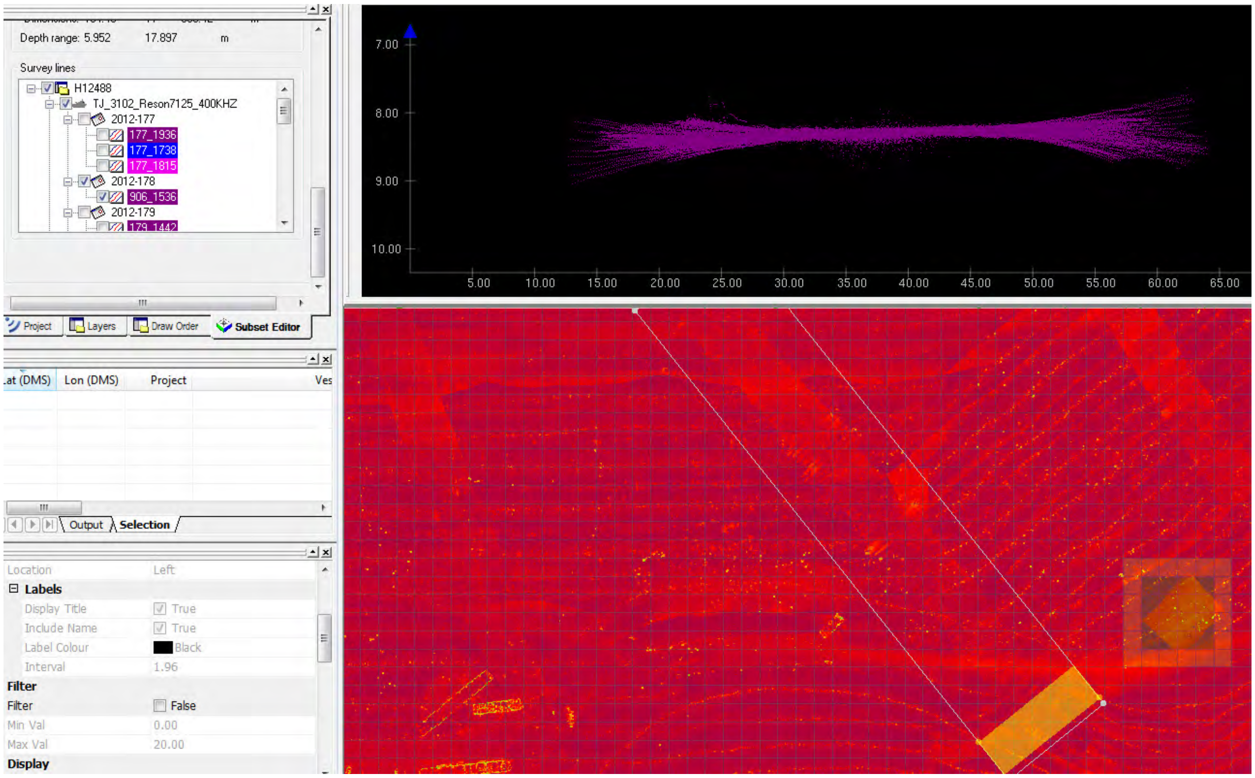


Figure 14: Altitude Anomaly as viewed in Attitude Editor as seen by isolated yellow rectangle. This also compares GPS Tide and Height to TCARI Tide. In this case Graph shows how smoothing is applied.

3.3.2 Attitude Anomaly

All the platforms experienced various attitude problems at one time or another.Uncertainty and standard deviation layers of the grids were also the best indication of major discrepancies. In cases where appropriate, data was either filtered to 45 degrees or deleted in subset editor. The types of attitude error observed could be heave, roll, or cocked pings. Examples are listed below. Although within specification, there was a slight Attitude error observed on both launches covering days 178 and 179 from west part of the sheet to crane neck. It can be seen as a wavy line when the grid is placed in high exaggeration. The weather was wind northeast at 10 to 15kts with 2ft chop. The majority of the anomaly was within the 8-14 meter curve, and due to possible dynamic sea conditions.



Depth range: 5.952 17.897 m

Survey lines

☑ H12488
- ☑ TJ_3102_Reson7125_400KHZ
  - ☐ 2012-177
    - ☐ 177_1936
    - ☐ 177_1738
    - ☐ 177_1815
  - ☑ 2012-178
    - ☑ 906_1536
  - ☐ 2012-179
    - ☐ 179_1442

Location	Left
Labels	
Display Title	☑ True
Include Name	☑ True
Label Colour	■ Black
Interval	1.96
Filter	
Filter	☐ False
Min Val	0.00
Max Val	20.00
Display	

Figure 15: Attitude Anomaly XL 3102 Possible timing

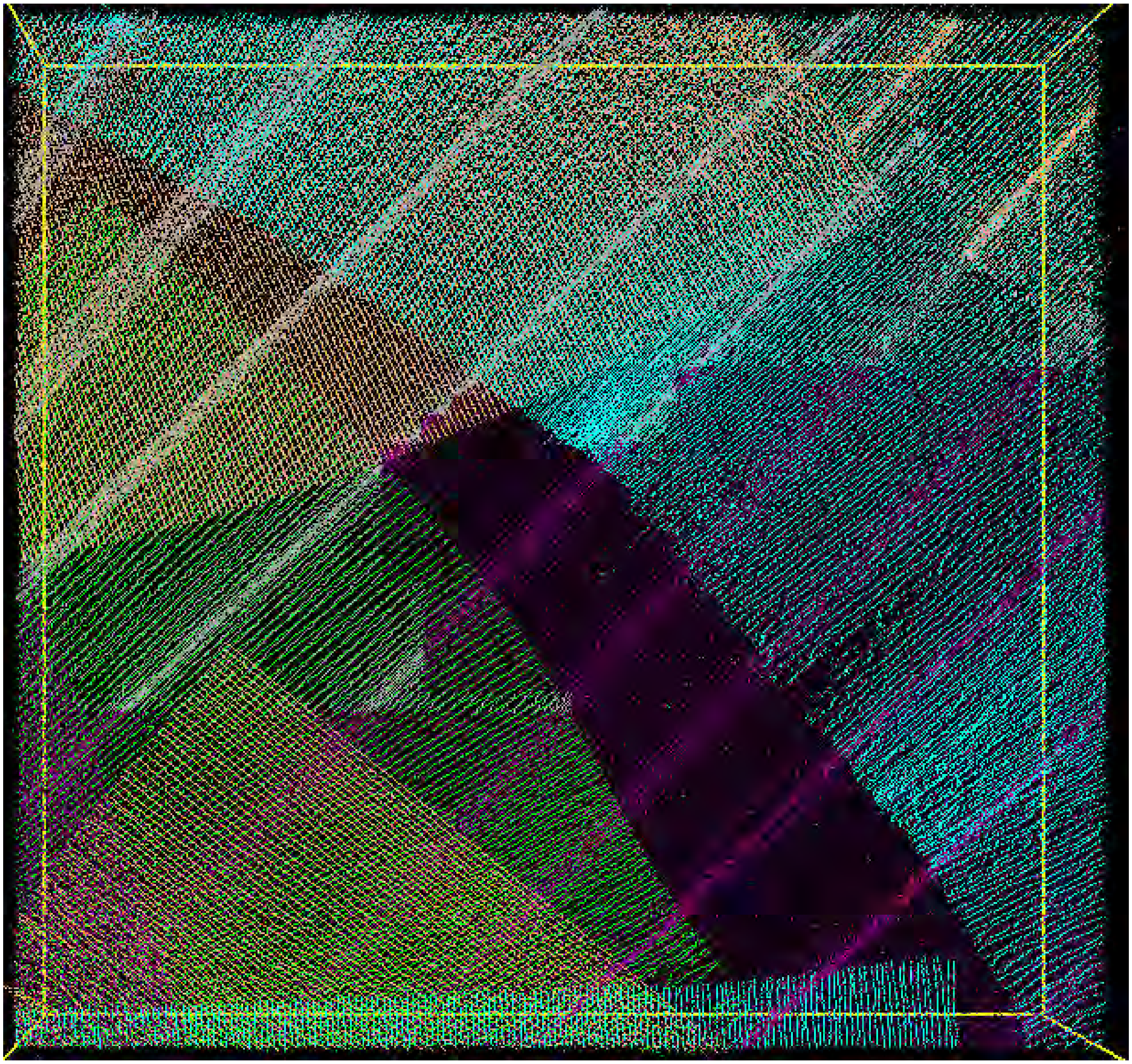


Figure 16: Attitude Anomaly Heave Artifact

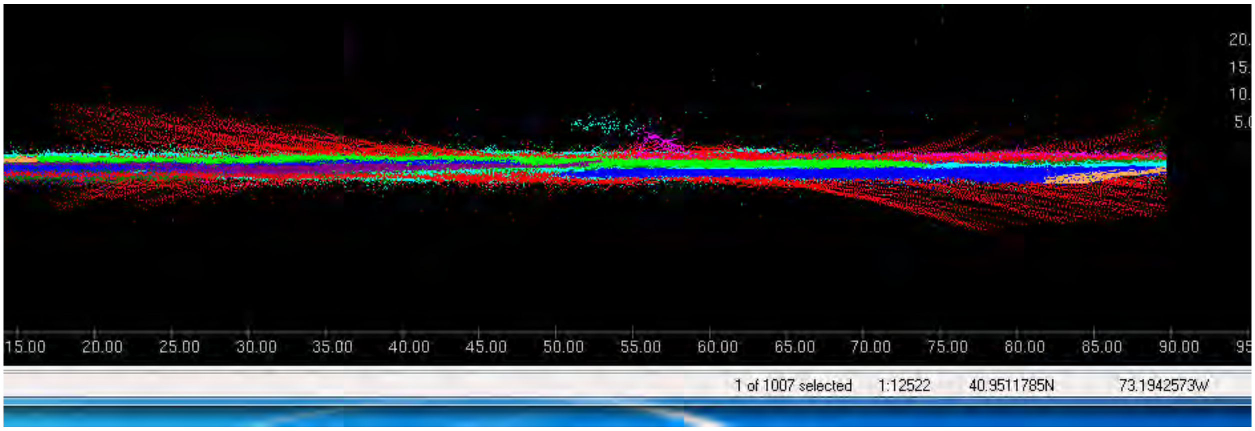


Figure 17: Attitude Anomaly 3101 DN 178 cocked Pings

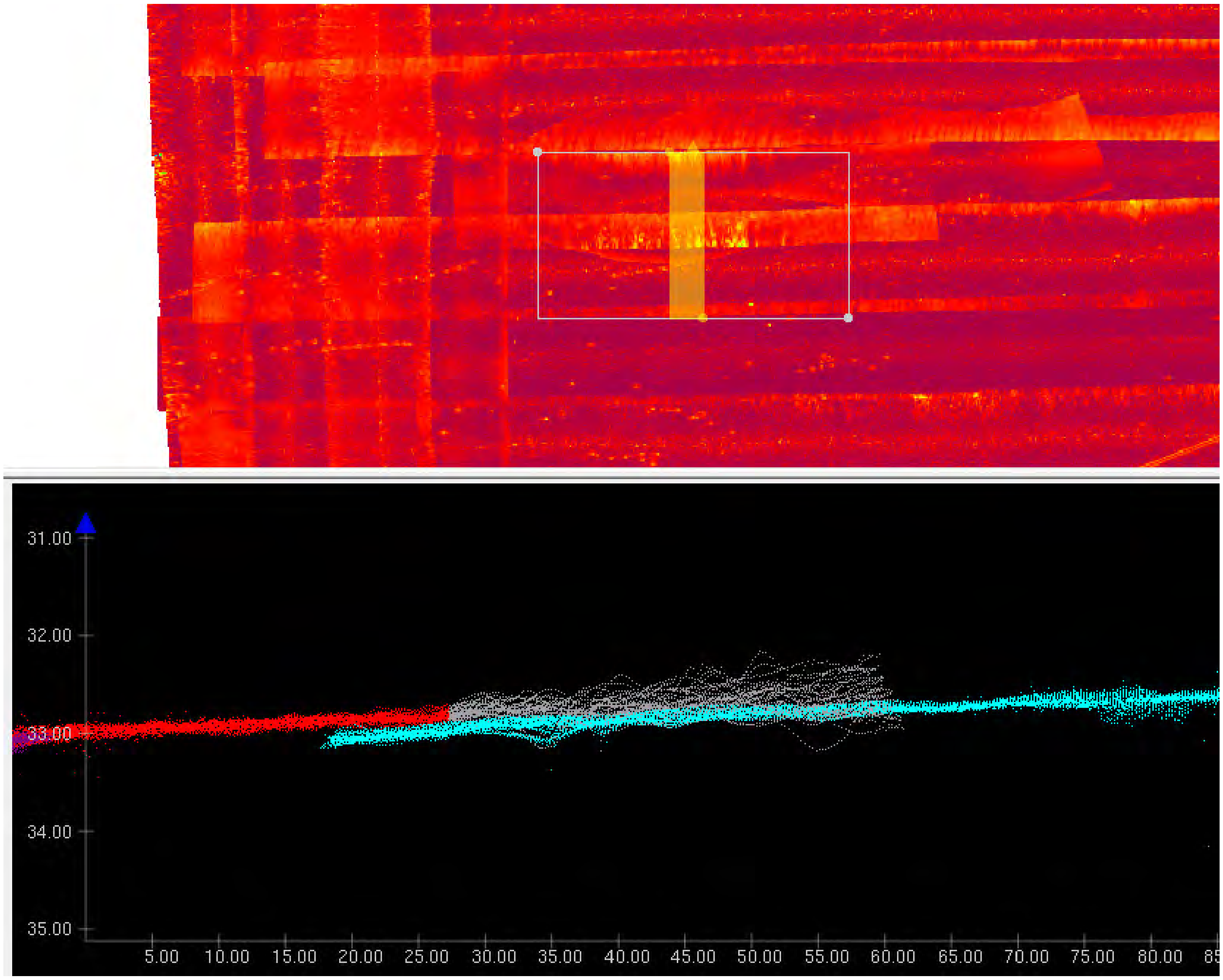


Figure 18: Attitude Anomaly outerbeam flareup

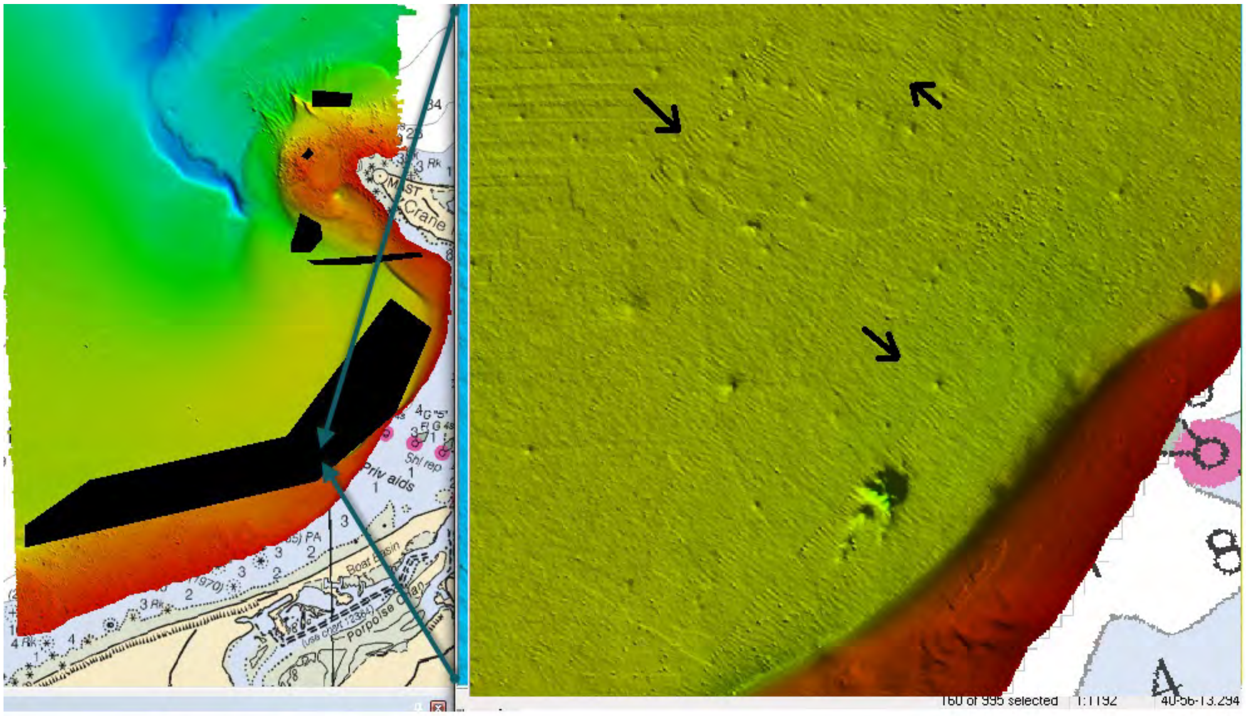


Figure 19: Attitude_Anomaly days 178- 179 timing

3.3.3 Side Scan Bleed Over

Some Dual MB/SSS was acquired simultaneously for near shore reconnaissance. The Reson 7125 MB and the Klein5000 SSS both have a frequency of 455khz. The triggering is set up in such a way that a pulse of SSS triggers the multibeam with minute delay so that for the most part there is no cross talk between the two sonars. The range of the SSS is much greater than the multibeam dependent on depth. The greater range of the SSS can cause the return to take a longer period of time between pulses. The multibeam may pick up what is known as a second sweep return. These were scanned in subset and where observed rejected.

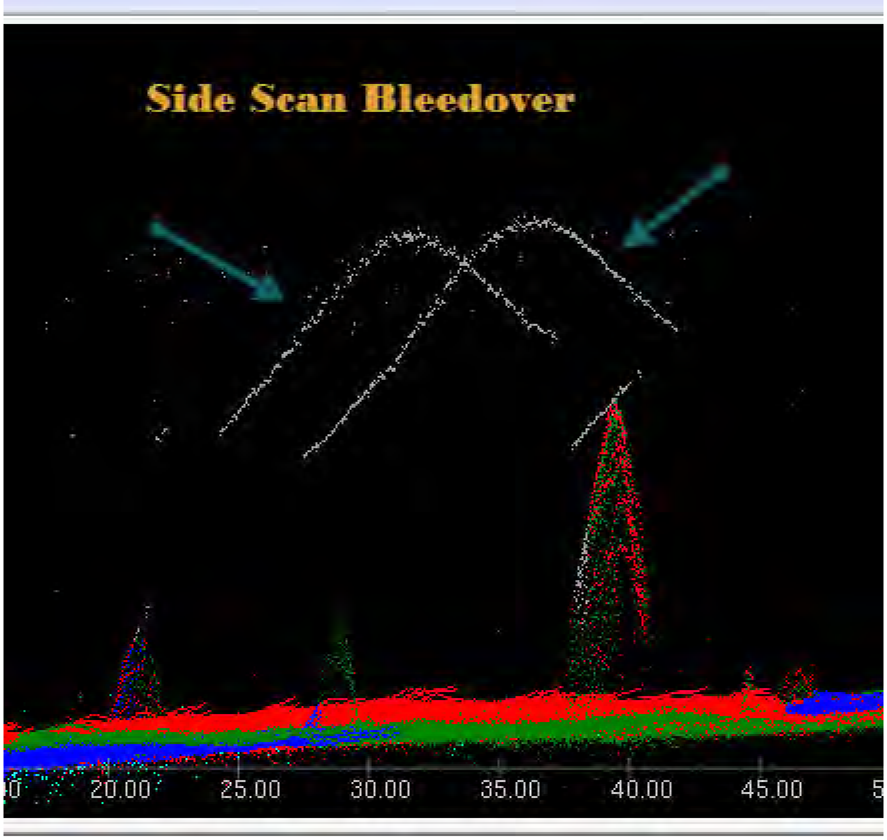


Figure 20: SSS Bleedover or crosstalk

3.3.4 Sound Speed and Refraction

Occasional errors due to sound speed or refraction were seen in outside beams. Where the observed surface exceeded specification the outside beams were deleted. In most cases the grid honored the surface.

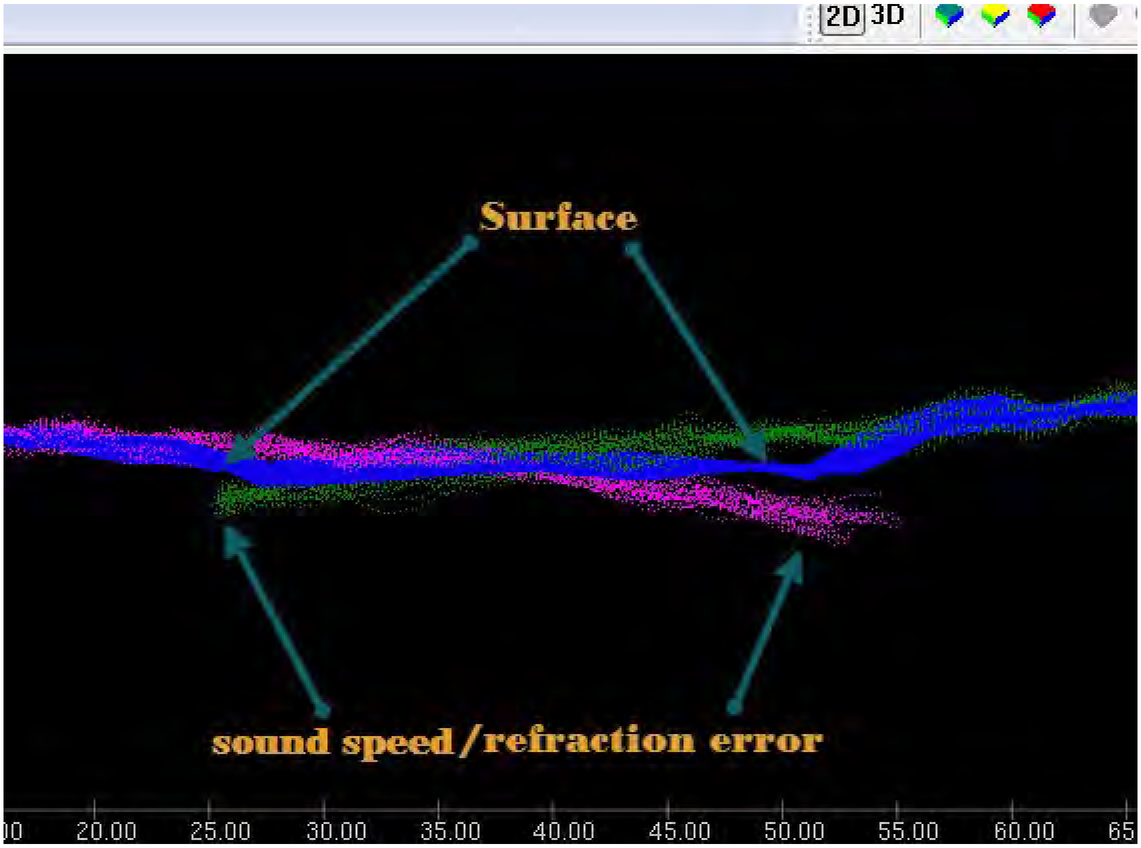


Figure 21: Sound Speed/Refraction of outside beams

D. Results and Recommendations

D.1 Chart Comparison

A difference grid was made from surveyed soundings to ENC depths. In addition a lattice and a overlay of ENC and Raster chart of Surveyed sounding was made noting differences.There was remarkable parity between ENC, charted, and surveyed soundings. Dangers to Navigation were sent on the most significant features.

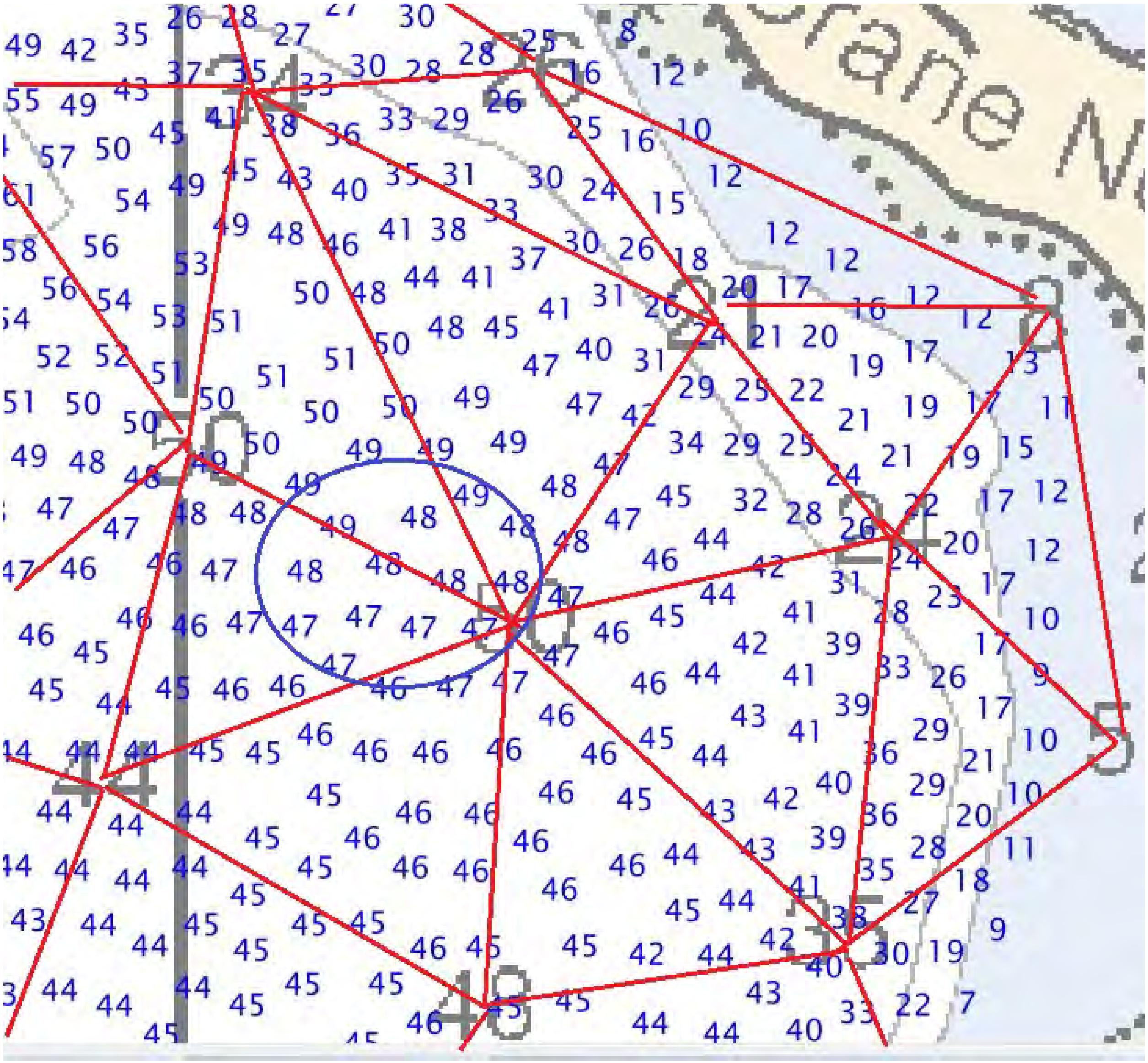


Figure 22: Example of Lattice Inspection

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
12363	1:80000	41	02/2010	04/27/2013	04/27/2013
12364	1:40000	39	09/2012	05/04/2013	05/04/2013

Table 12: Largest Scale Raster Charts

12363

Chart 12363 varied slightly in positions due to its smaller scale. The chart was comparable to the larger scale chart. See 12364 for details.

12364

Two detached positions were taken on verifying buoy positions. G "1" Fl G 4s was located on station at 40-56-14.892N 073-09-46.098W it is a Coast Guard maintained buoy. Chart 12363 has the Private Aids text in an acceptable location. The chart 12364_21 has a "Priv aids" text over the G"1" buoy which is false. The private aids begin at G"3 and continue as private aids into Porpoise Channel. The text should be moved to reflect those ATON's. Buoy G"3" was not found on station but is in place at a different location. The private aids are maintained by the Town of Smithtown as reported by the Harbor Master. The buoys are seasonal and are periodically moved for best water. For exact locations contact the Smith Town Harbor Master, Pat Gilligan at 361 360 7643.

The Fish Haven appears to be charted inappropriately as no soundings or features were comparable to the prescribed depth and were actually deeper. The AWOIS list description of the Fish Haven is fairly accurate in describing the items located south of the Fish Haven in the new Wreck area.

New Rocks and Wrecks as well as evidence of shoaling were found in the south west section and Crane Neck. Fig 24 and 25 show examples of charted differences.

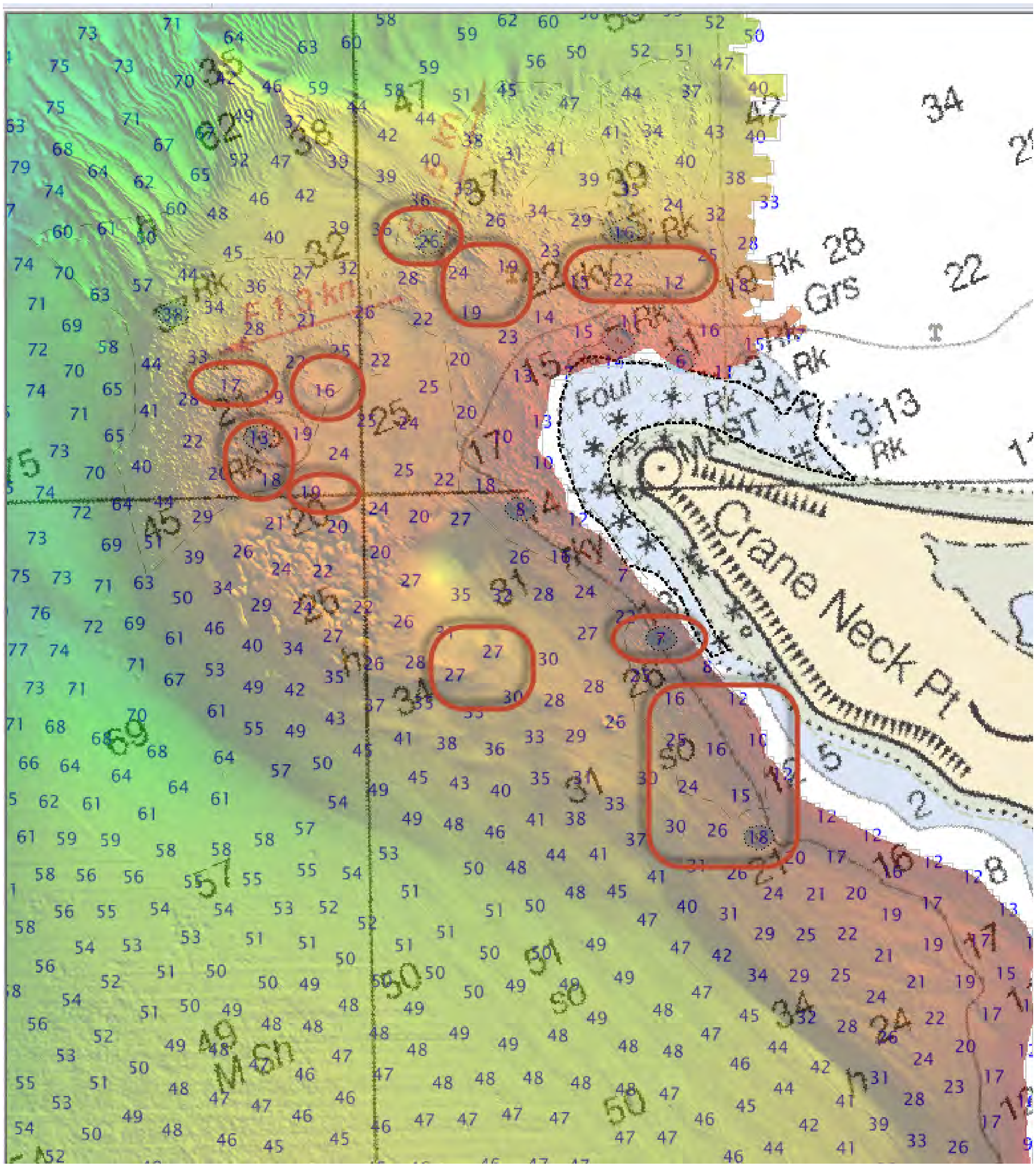


Figure 23: Crane Neck

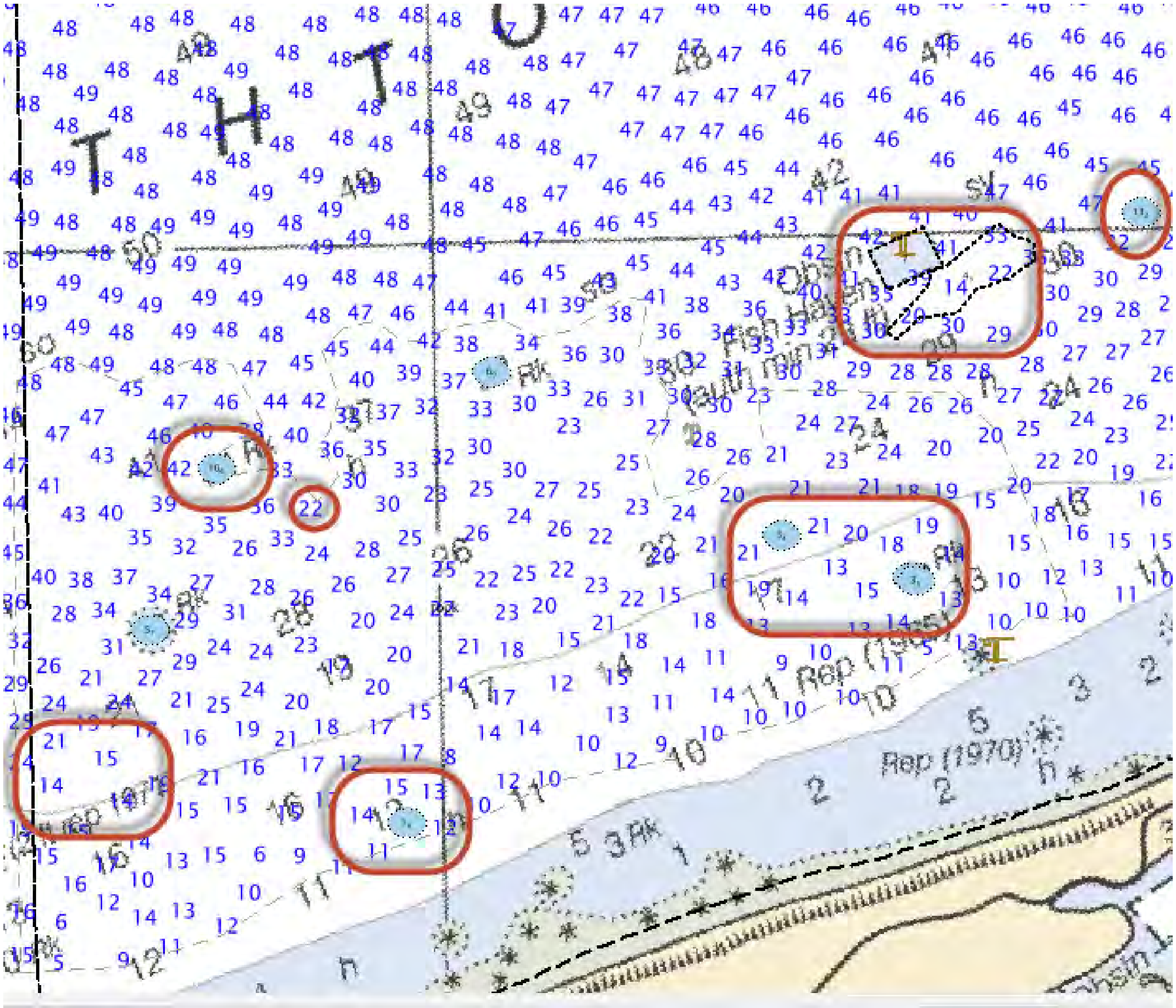


Figure 24: South west

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US5CN10M	1:40000	2	02/14/2011	02/14/2012	NO
US4NY13M	1:80000	13	06/23/2013	02/07/2012	NO

Table 13: Largest Scale ENCs

US5CN10M

This ENC is similar to US4NY13M but has sparser sounding. Results were of a similar nature.

US4NY13M

Overall, The results general shifts in positioning of shoals and deeps between charted soundings. Of the surveyed soundings 70% were within 1 foot, 25% of the soundings were shoal and 5% were deep. The majority of shoal sounding occurred near rock strewn areas near Crane Neck and southwest corner. Uncharted rocks and wrecks were found especially south of the charted fish haven. In Fig. 26, green displays comparable surveyed soundings (-0.6 to 06m). Yellow and red are surveyed soundings shoal of the ENC(-0.6 to -1.0m). Blue and Purple deeper than ENC(0.6 to 1.0m). The northwest corner has a huge difference because of the sparseness of depths from the ENC. The southwest corner and Crane Neck have big differences deepening in large areas but shoaling up on new rocks and the tops of sand waves. There is a circular pattern of change with the locus at Crane Neck. For results See Separates IV.

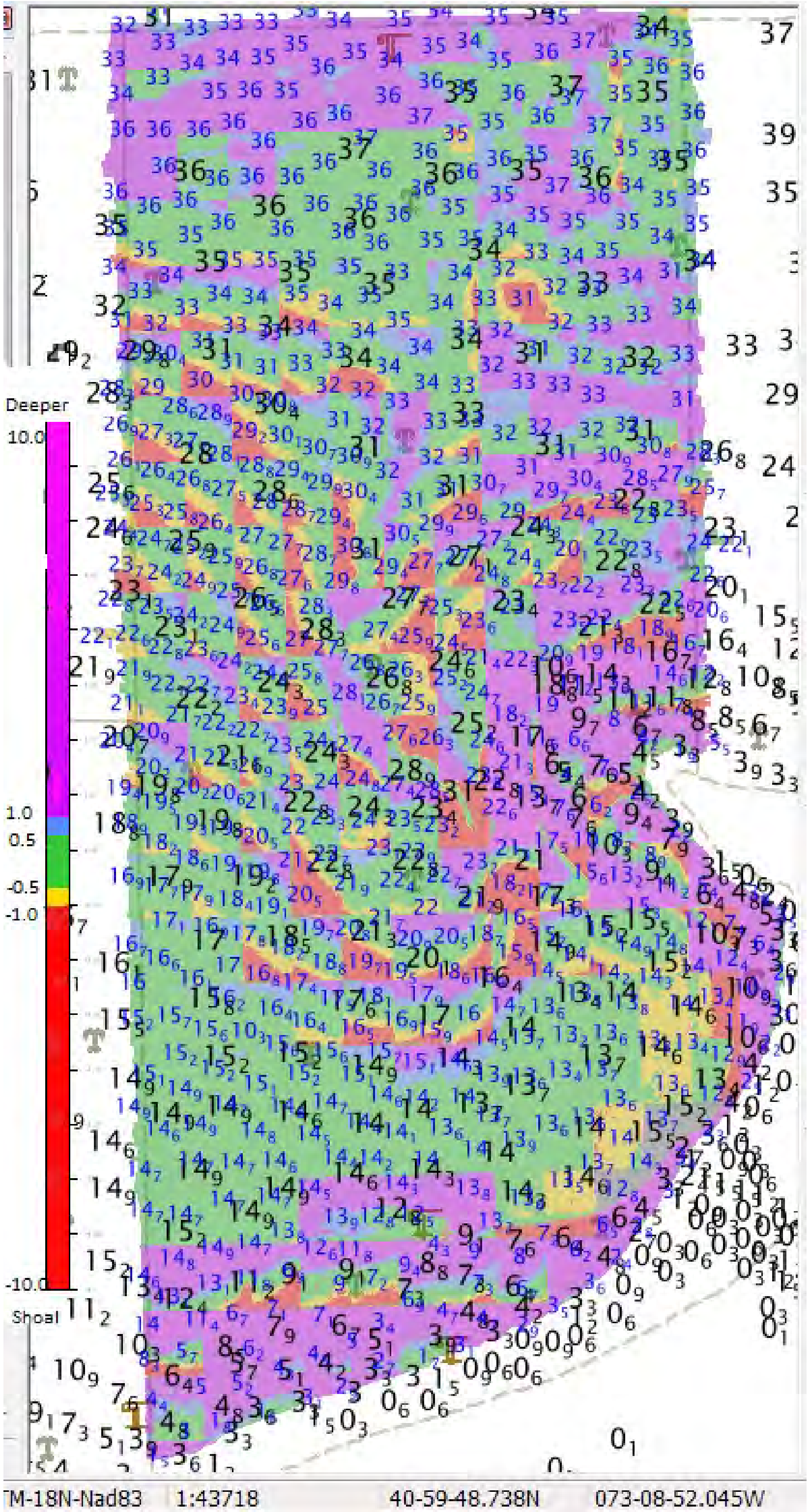


Figure 25: H12488_to ENC Difference (Red Shoa)l to (Purple Deep)

D.1.3 AWOIS Items

Four AWOIS items exist for this survey and are described in the Final Feature File.

D.1.4 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.5 Charted Features

There are 15 charted features that fell within the survey limits. Some Charted features were not investigated. These were inside the NALL line or 4m curve. A portion of the 2 ft Rep, AWOIS 14973 radius, on the west side of the sheet was disproved. Further information can be found on survey H12414.

D.1.6 Uncharted Features

The most significant item on this survey is a group of wrecks and obstructions that appear to have sunk as a fish haven.The current charted fish haven just north of the area and appears to have been miss-positioned. The fish haven is free of any obstructions and the authorized minimum depth does not correlate to any surveyed sounding. The soundings inside the obstruction area do have correlation, as well as the AWOIS description of the items found.

D.1.7 Dangers to Navigation

Danger to Navigation Reports are included in Appendix II of this report.

D.1.8 Shoal and Hazardous Features

Shoal areas exist near Crane Neck Point and the south west section of H12488. New Rock and a Wreck area were found and are described in the Final Feature File.

D.1.9 Channels

The Northport Anchorage Area intersects a part of this survey. No features or depths found in this area pose a danger. No channels exist for this survey. There are no precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

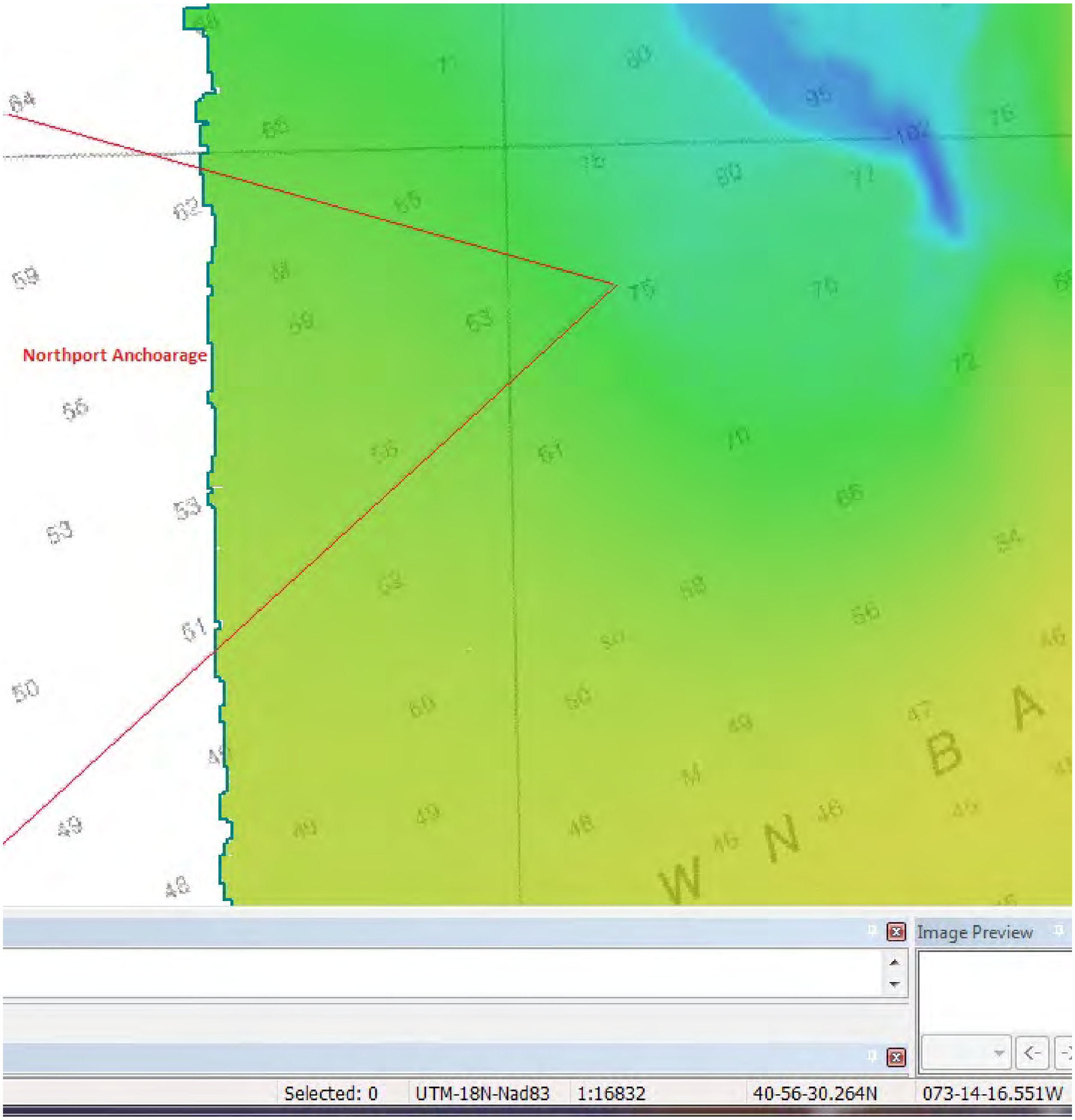


Figure 26: Northport Anchorage

D.1.10 Bottom Samples

No bottom samples were required for this survey.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was assigned in the Hydrographic Survey Project Instructions but was inside the NALL line and was not investigated.

D.2.2 Prior Surveys

There are three prior surveys that intersect with H12488. All three were completed in 1967. The comparison was made in feet by comparing rasters, no digital data was available. The greatest shoaling appears to occur in the southwest corner of H12488 and near Crane Neck Point, both are have considerable rocks and boulders and sand waves. Differences range from 3-15 ft depending on whether new rock features and sand waves were discovered. The deeper areas (45-100ft) have difference+/- 2-3 ft no visible trends.

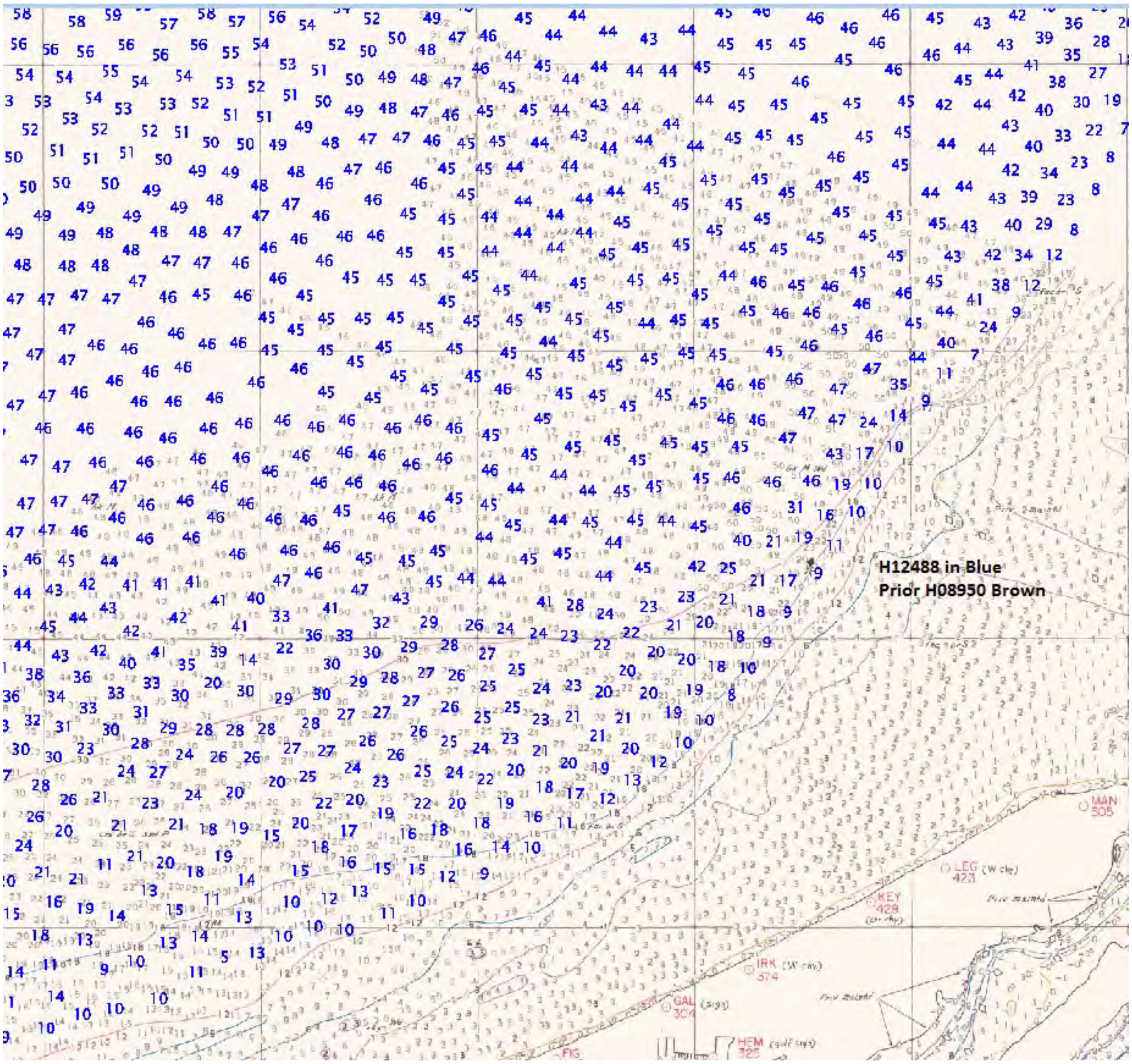


Figure 27: H08950_E

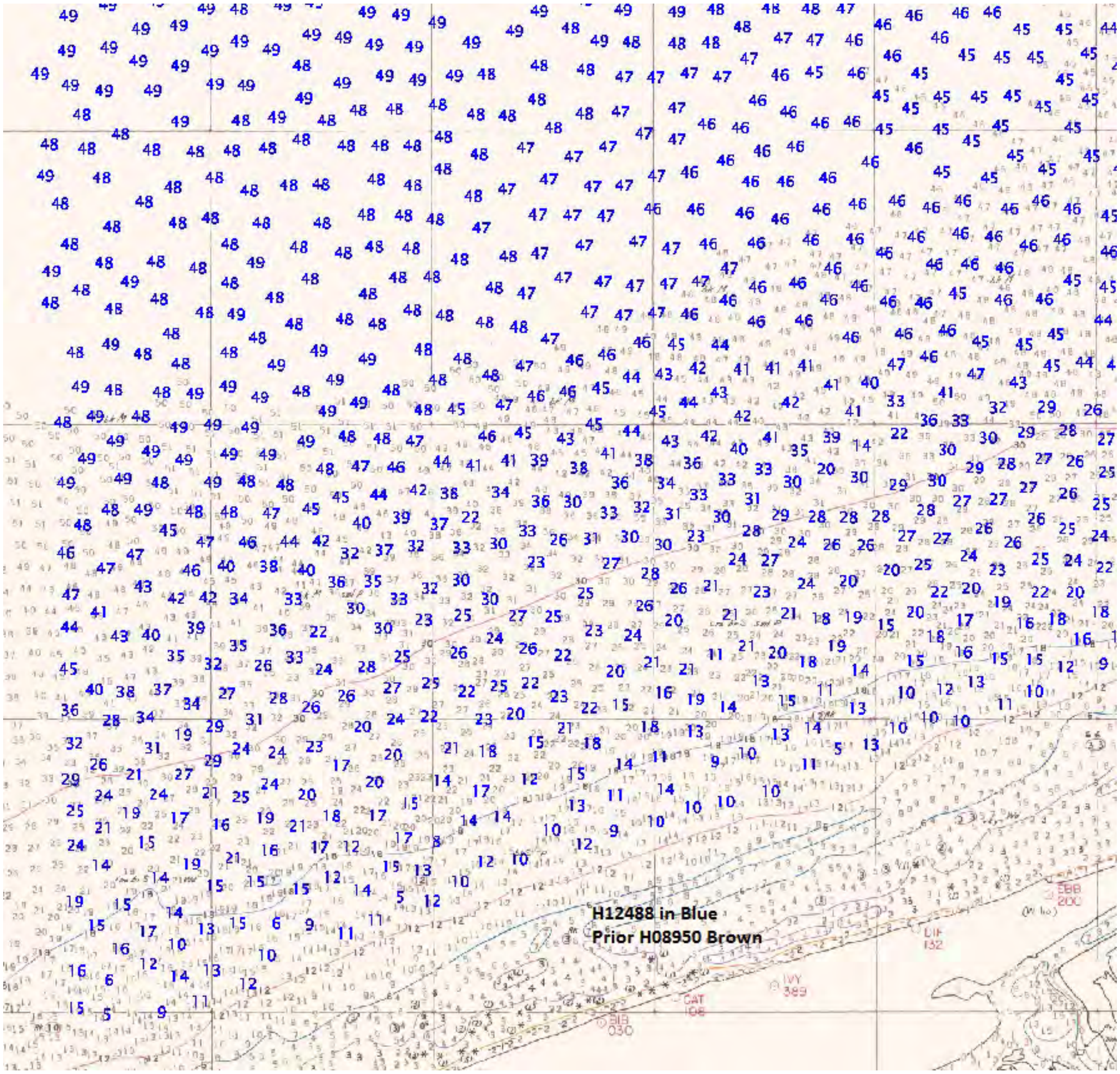


Figure 28: H08950_W

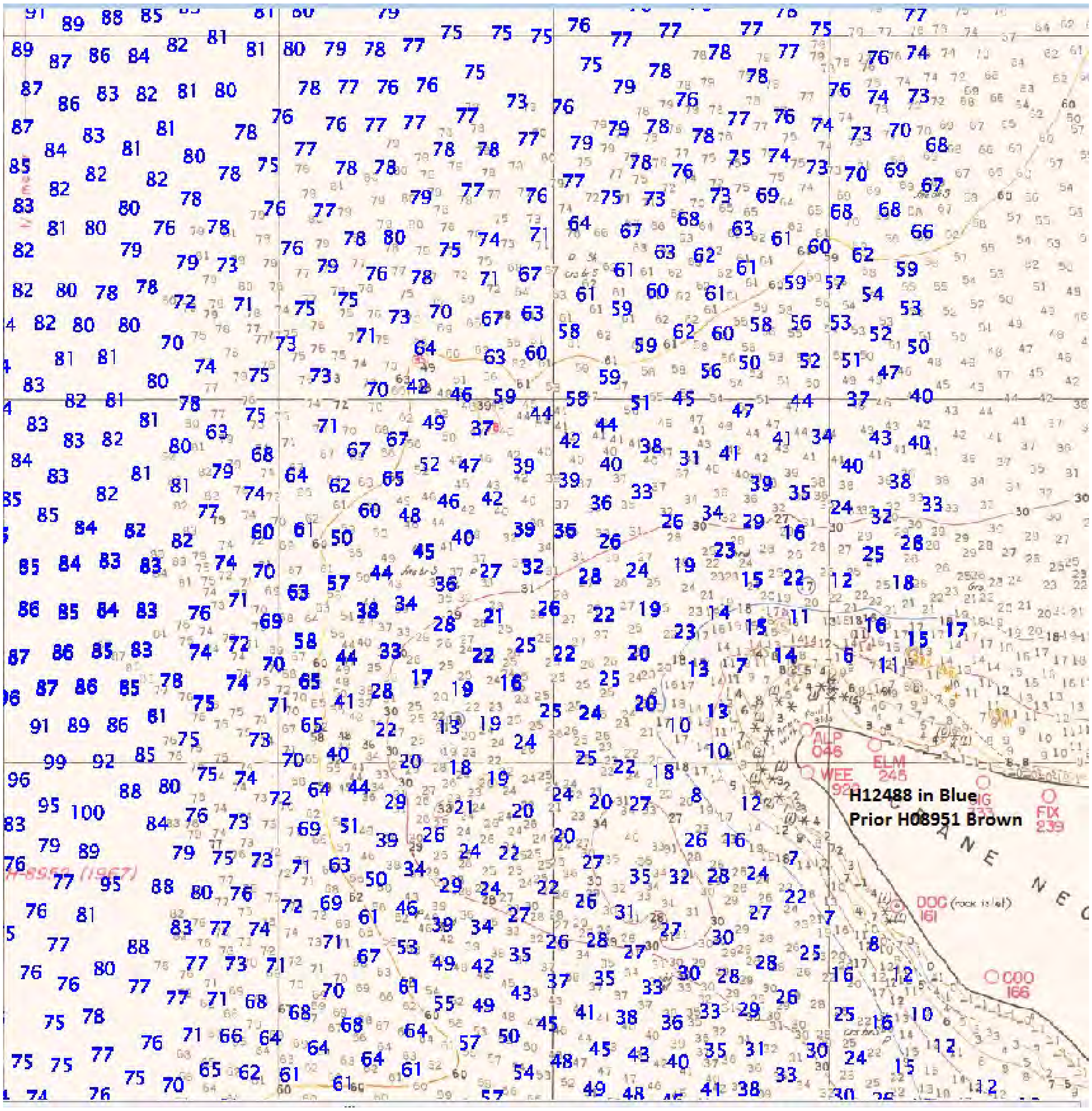


Figure 29: H08951_N

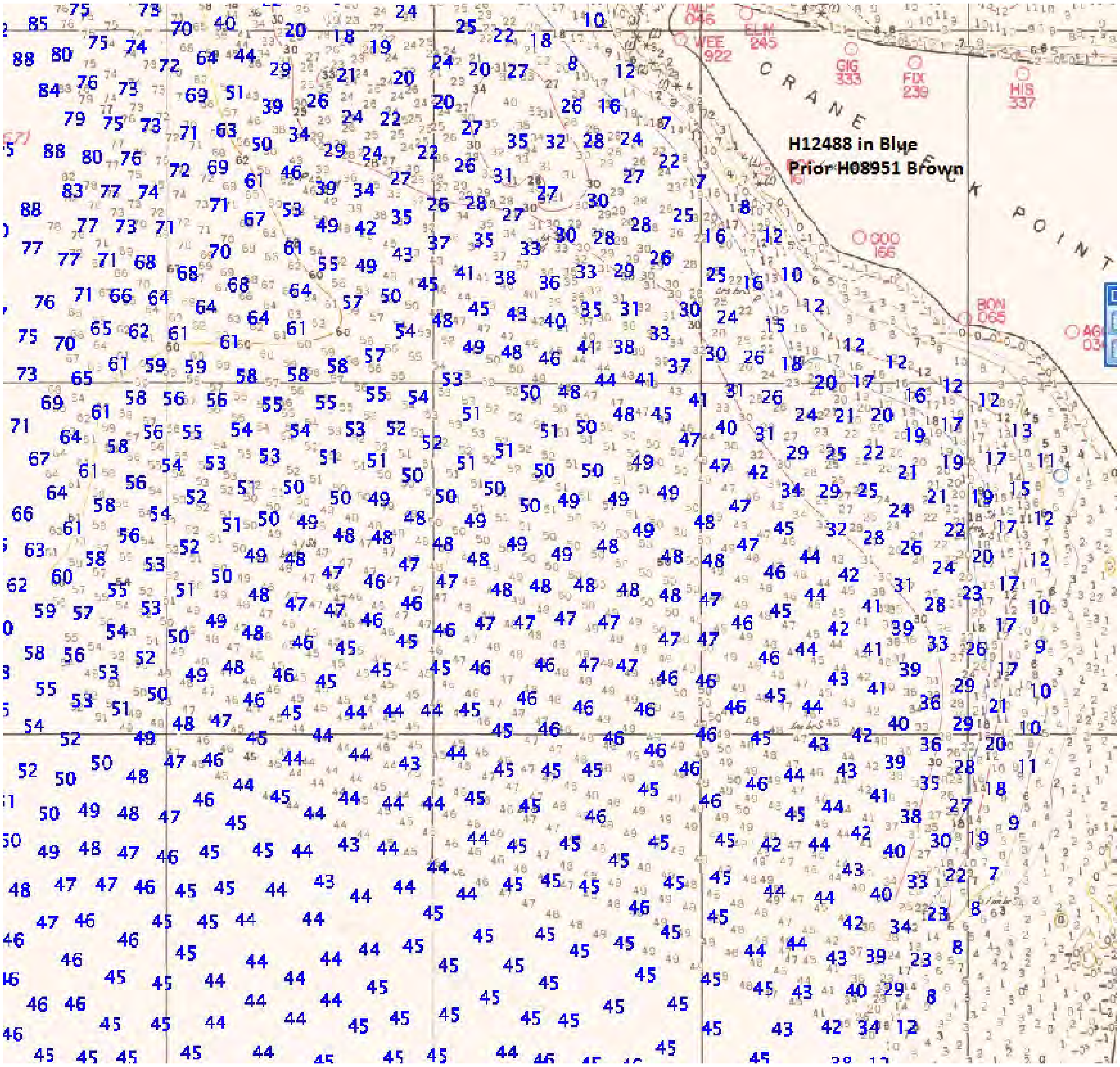


Figure 30: H08951_S

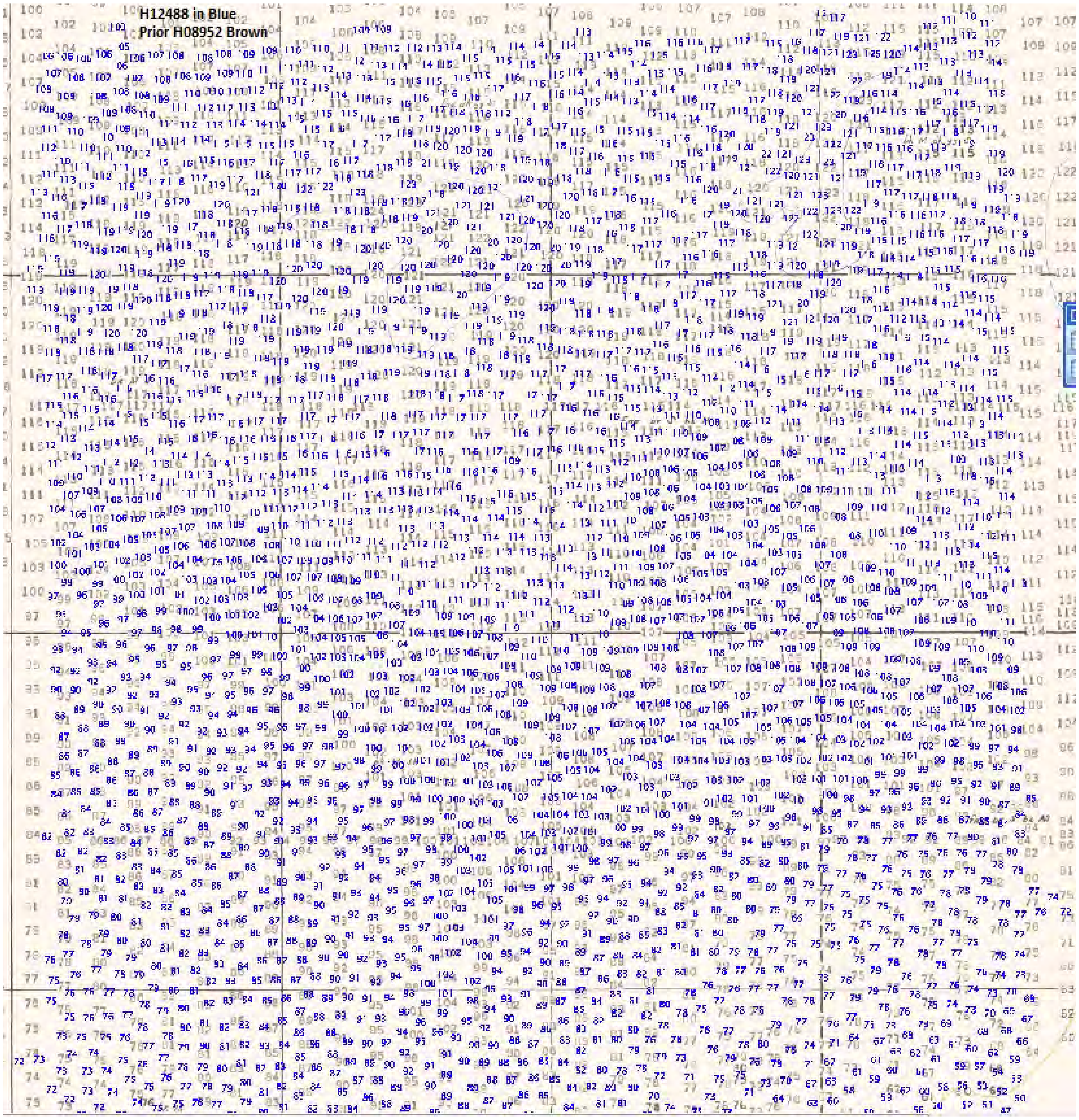


Figure 31: H08952_N

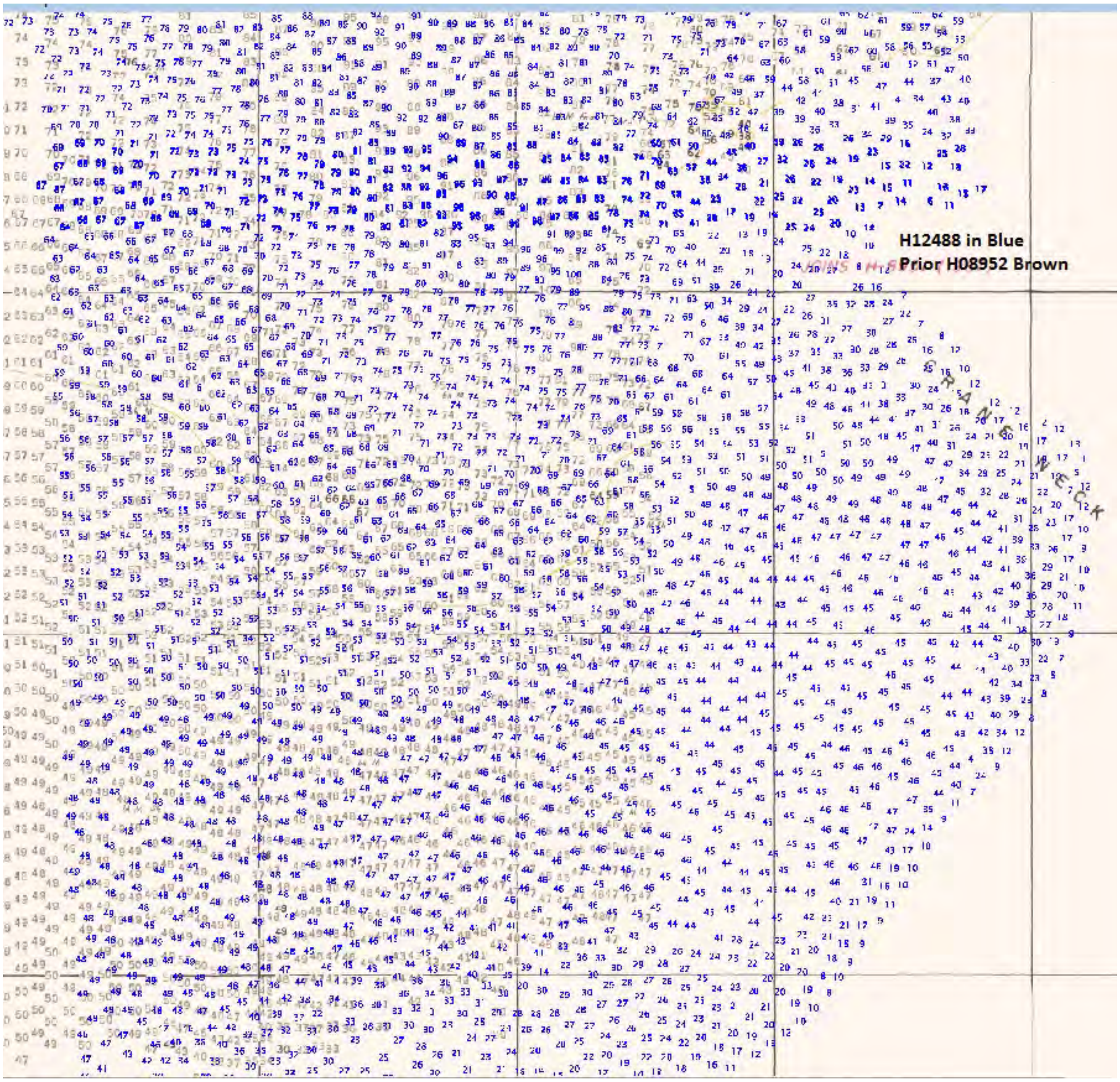


Figure 32: H08952_S

D.2.3 Aids to Navigation

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

One cable line crosses the north portion of H12488.

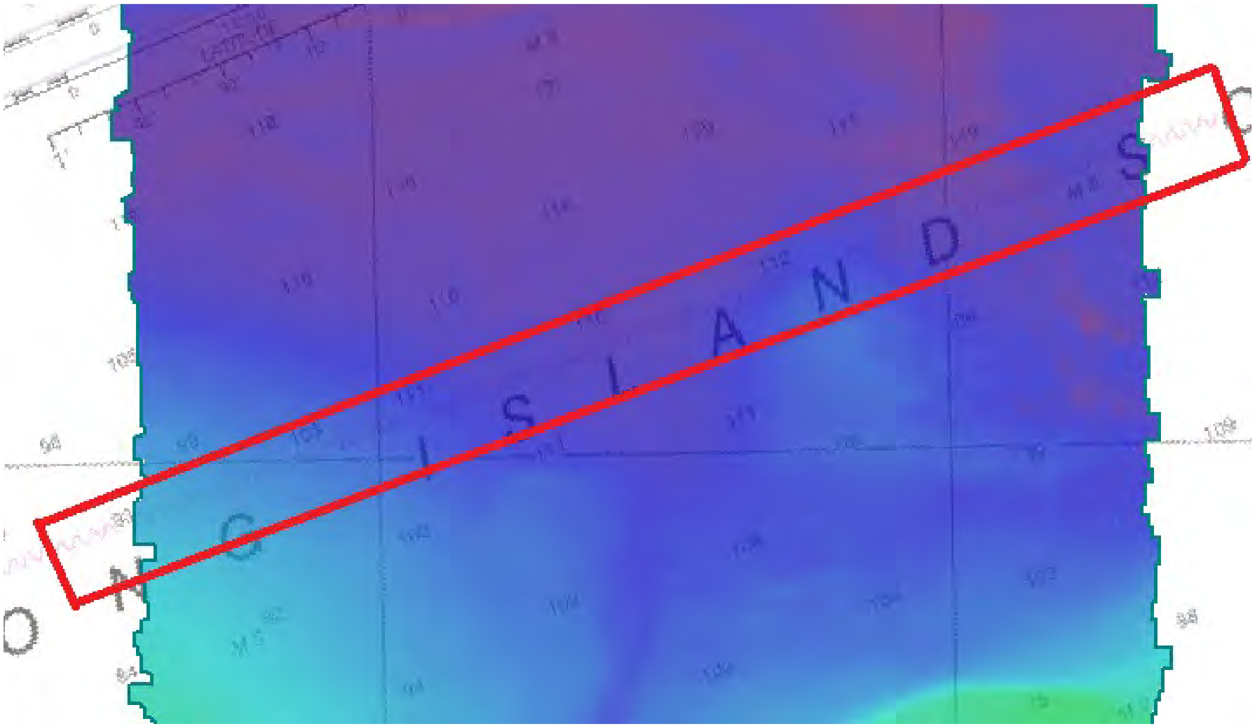


Figure 33: Under Water Cable

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

Two buoys were encountered and are mentioned in the chart comparison.

D.2.9 Construction and Dredging

No present or planned construction or dredging exist within the survey limits.

D.2.10 New Survey Recommendations

No new surveys or further investigations are recommended for this area.

D.2.11 New Inset Recommendations

No new insets are recommended for this area.

E. Approval Sheet

As Chief of Party, Field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
James Crocker CDR, NOAA	Commanding Officer	02/13/2014	
Megan Guberski LT, NOAA	Field Operations Officer	02/13/2014	
Peter Lewit	Chief Hydrographic Survey Technician	02/13/2014	

F. Table of Acronyms

Acronym	Definition
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	Definition
HSTP	Hydrographic Systems Technology Programs
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	Definition
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Porpagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

H12417

NOAA Form 76-35A

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey

DESCRIPTIVE REPORT

Type of Survey: Navigable AreaSupport USCG

Registry Number: H12417

LOCALITY

State: New York

General Locality: Long Island Sound

Sub-locality: Mt. Misery Pt. to Sound Beach, NY

2012

CHIEF OF PARTY
CDR Lawrence T. Krepp

LIBRARY & ARCHIVES

Date:

NOAA FORM 77-28
(11-72)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H12417

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State:	**New York**
General Locality:	**Long Island Sound**
Sub-Locality:	**Mt. Misery Pt. to Sound Beach, NY**
Scale:	**5000**
Dates of Survey:	**05/19/2012 to 06/23/2012**
Instructions Dated:	**05/20/2012**
Project Number:	**OPR-B340-TJ-12**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**CDR Lawrence T. Krepp**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**
H-Cell Compilation Units:	***meters at Mean Lower Low Water***

Remarks:

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Descriptive Report to Accompany Survey H12417

Project: OPR-B340-TJ-12
Locality: Long Island Sound
Sublocality: Mt. Misery Pt. to Sound Beach, NY
Scale: 1:5000
May 2012 - June 2012
NOAA Ship *Thomas Jefferson*
Chief of Party: CDR Lawrence T. Krepp

A. Area Surveyed

Survey sheet area is in the vicinity of Mt. Misery Point, NY.

A.1 Survey Limits

Data was acquired within the following survey limits:

Northeast Limit	Southwest Limit
41.025 N 72.9421666667 W	40.967 N 73.0708333333 W

Table 1: Survey Limits

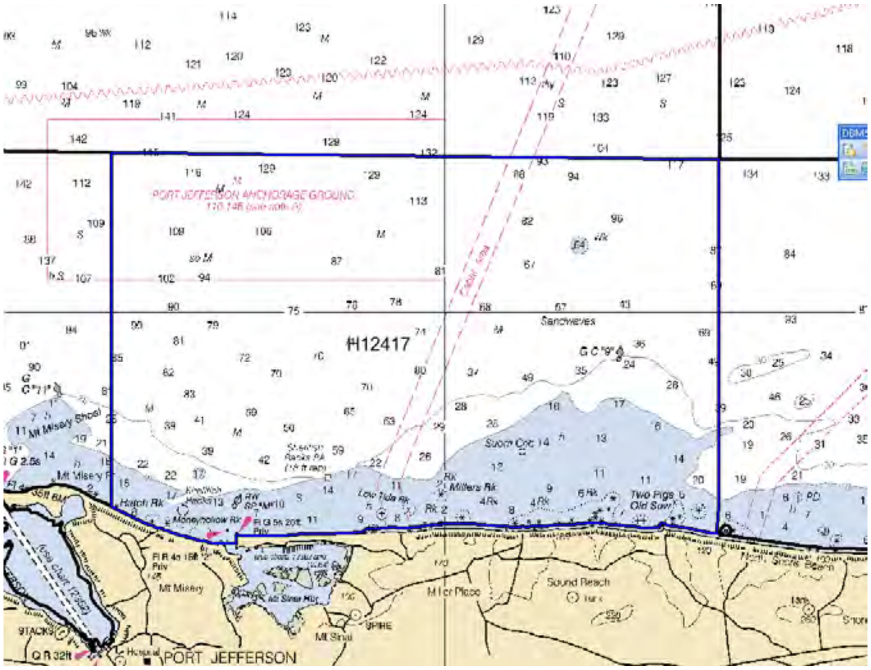

Figure 1: Survey limits for H12417

Survey Limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

The purpose of this survey is to support safe navigation by updating nautical charting products with contemporary hydrographic data. Additionally, data acquired by this survey will support the Long Island Seafloor Mapping Initiative for the states of Connecticut and New York. Finally, this project will assist the Coast Guard in establishing new achorage grounds in Long Island Sound.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

This hydrographic survey was completed as specified by Hydrographic Survey Letter Instructions OPR-B340-TJ-12, dated 24th April, 2012. No additional work is needed to complete this survey. No changes significant to navigation have been noted and it is recommended that this survey receive normal processing priority.

A.4 Survey Coverage

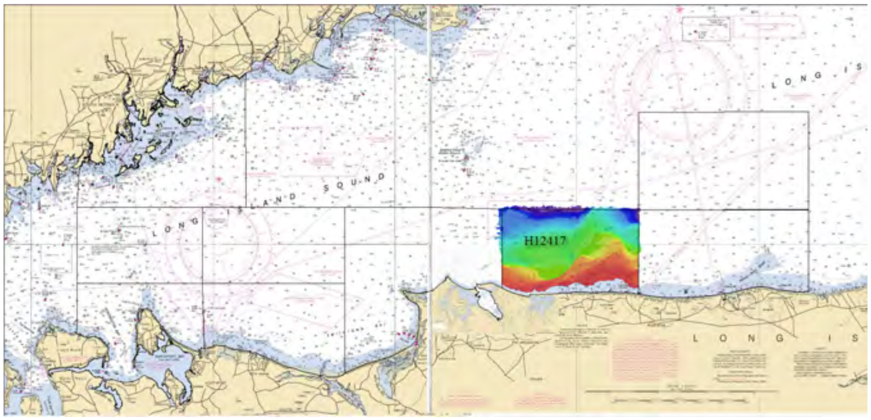

Figure 2: H12417 survey coverage.

In six areas, no longer than 165 meters across, the 4 meter nearshore limit of hydrography was not met due to launch safety concerns.

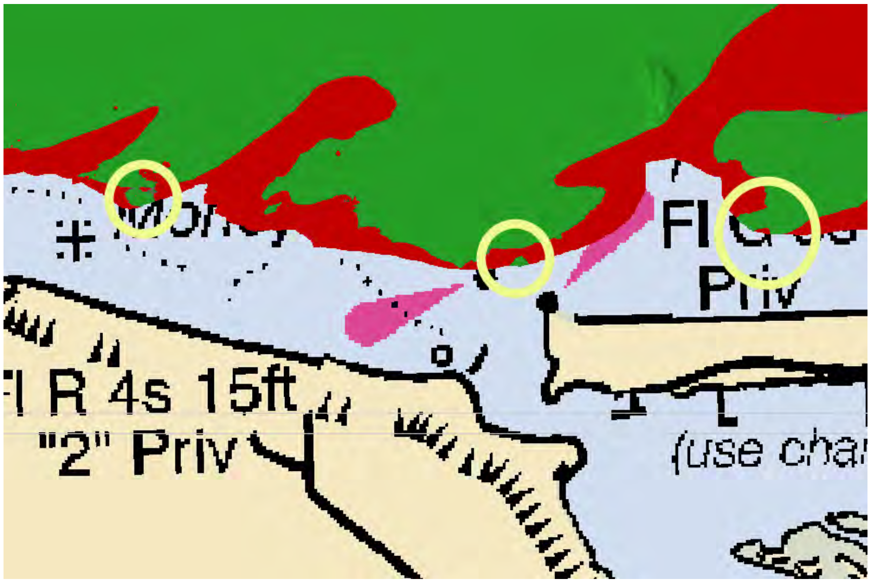

Figure 3: Circled locations indicate areas where the 4m limit was not reached on the western portion of the sheet.

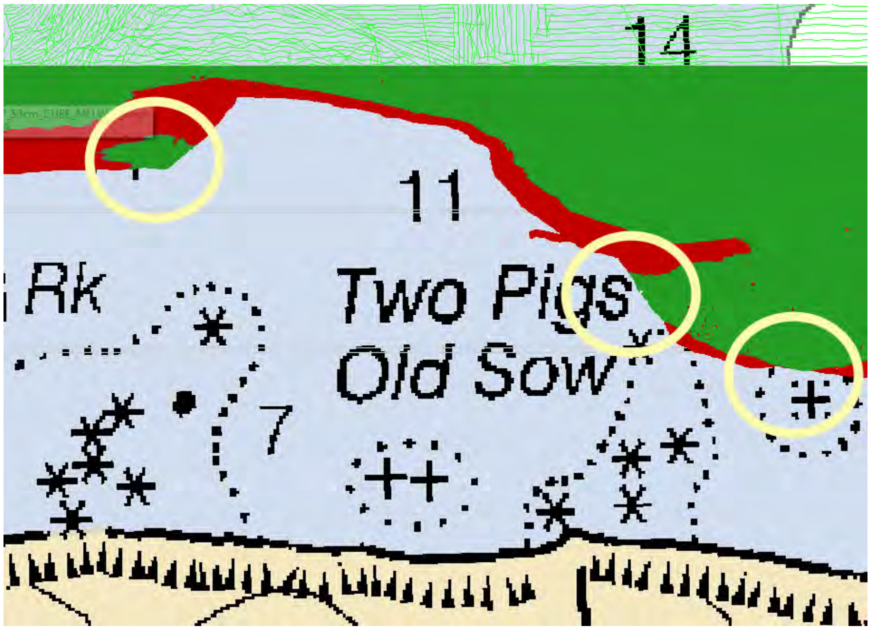

Figure 4: Circled locations indicate areas where the 4m limit was not reached on the eastern portion of the sheet.

A.5 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	***S222***	***3101***	***3102***	***Total***
LNM	**SBES Mainscheme**	0	0	0	0
	MBES Mainscheme	386.78	494.52	189.38	1070.68
	Lidar Mainscheme	0	0	0	0
	SSS Mainscheme	0	0	0	0
	SBES/MBES Combo Mainscheme	0	0	0	0
	SBES/SSS Combo Mainscheme	0	0	0	0
	MBES/SSS Combo Mainscheme	0	0	0	0
	SBES/MBES Combo Crosslines	17.59	26.73	0	44.32
	Lidar Crosslines	0	0	0	0
Number of Bottom Samples					0
Number of DPs					0
Number of Items Items Investigated by Dive Ops					0
Total Number of SNM					19.06

Table 2: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates
05/19/2012
05/20/2012
05/22/2012
05/23/2012
05/24/2012
05/30/2012
05/31/2012
06/01/2012
06/02/2012
06/03/2012
06/04/2012
06/05/2012
06/06/2012
06/07/2012
06/08/2012
06/11/2012
06/12/2012
06/23/2012

Table 3: Dates of Hydrography

A.6 Shoreline

Shoreline was investigated in accordance with the Project Instructions and the HSSD.

A.7 Bottom Samples

Updated bottom sample locations were provided after the project instructions were given. There were no bottom samples included within the sheet limits for H12417 in the revised files.

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***3102***	***3101***	***S222***
LOA	31 feet	31 feet	210 feet
Draft	3 feet	3 feet	14 feet

Table 4: Vessels Used

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
Reson	7125 ROV	MBES
Reson	7125 SV1	MBES
Applanix	POSMV	Positioning and Attitude System
Seabird	Seacat19+	Conductivity, Temperature and Depth Sensor
Brooke Ocean	MVP100	Sound Speed System

Table 5: Major Systems Used

Data were acquired by NOAA Ship Thomas Jefferson, launch 3101 and launch 3102. NOAA Ship Thomas Jefferson, launch 3101 and launch 3102 acquired Reson 7125 multibeam echo sounder (MBES) soundings and sound velocity profiles. Vessel configurations, equipment operation and data acquisition and processing were consistent with specifications described in the DAPR.

B.2 Quality Control

B.2.1 Crosslines

Crossline comparison was conducted using the difference surface method in CARIS BathyDataBASE. Crosslines agreed very well with main scheme bathymetry, in most cases less than 10cm of difference was noticed. Computed statistics from the difference surface: mean: 0.02m, stdev: 0.19m. A maximum difference of 0.8m occurred in a small area where shifting sand waves were present. Nearby charted "Sandwaves" should be retained.

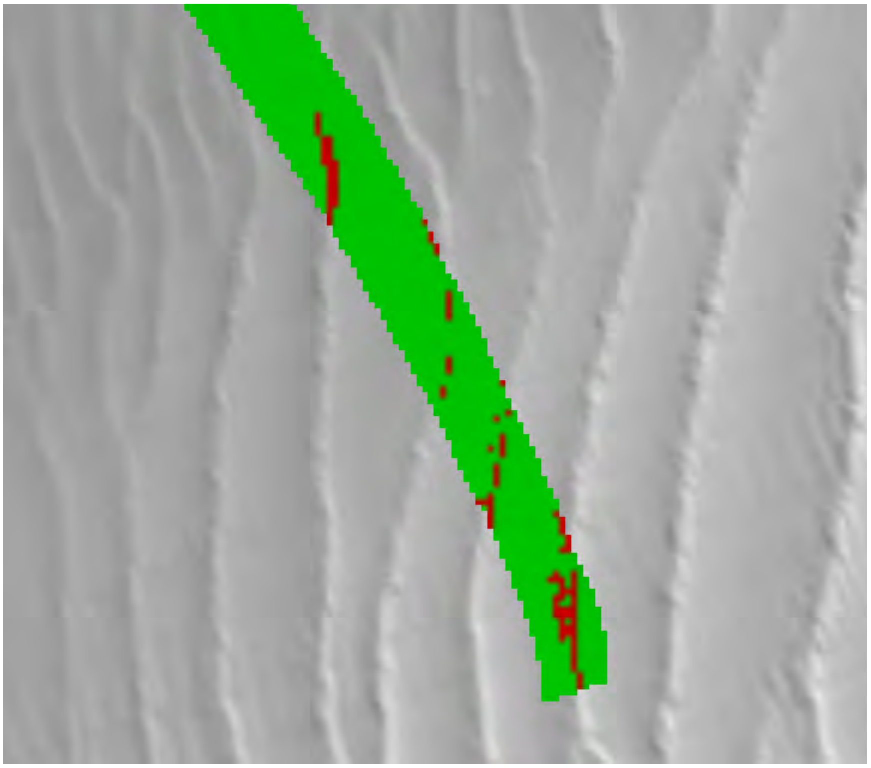

Figure 5: Red bands illustrate greater than 0.25m of difference between crossline and mainscheme in the area with the most prevalent sand wave movement.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0meters	0.102meters
0meters	0meters

Table 6: Survey Specific Tide TPU Values

Hull ID	**Measured - CTD**	**Measured - MVP**	**Surface**
S222	N/A meters/second	1meters/second	0.2meters/second
3101	4meters/second	N/A meters/second	0.2meters/second
3102	4meters/second	N/A meters/second	0.2meters/second

Table 7: Survey Specific Sound Speed TPU Values

Data were initially processed to the ellipsoid using POSPac MMS Smoothed Best Estimate of Trajectories (SBET). These SBETs include horizontal and vertical error data and this data is included in the TPU computations. The tidal uncertainty values in the top row represent the uncertainties in the VDATUM solution for the area. All lines with GPS tides applied utilized tidal values in the top line.

CO-OPS provided tide uncertainty values for the TCARI surface and the VDATUM solution that is part of the Total Propagated Uncertainty (TPU) calculation. TPU is calculated and written to each line's HDCS file (CARIS processed data format). When surfaces are created, an uncertainty child layer is created. This child layer represents the amount of uncertainty for individual nodes in the surface based on a combination of a priori values from equipment vendors, values determined from environmental observation in the field, and from automated empirical analysis of data in real-time. Once all investigated features have been reviewed and least depths have been designated, surfaces are finalized. In finalization, the standard deviation for each node in the surface is multiplied by 1.96 to provide the 95% (2-sigma) confidence value for the node. This 2-sigma standard deviation is compared to the computed Total Vertical Uncertainty (TVU) for each node. The larger of the two values is retained as the finalized Uncertainty for each node. Uncertainty is reported in meters. IHO has established allowable TVU values for each order of survey. This survey meets IHO Order I TVU requirements in 100% of nodes in the final surface. All lines with TCARI as the final tidal corrector utilized the tidal uncertainty values in the second line in the table above.

B.2.3 Junctions

H12417 junctions with three surveys and sounding agreement is within 2 feet.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H12416	1:5000	2012	NOAA Ship THOMAS JEFFERSON	W
H12437	1:40000	2012	NOAA Ship THOMAS JEFFERSON	E
H11044	1:20000	2001	NOAA Ship RUDE	N

Table 8: Junctioning Surveys

H12416

Processing of H12416 had not been completed at the time this DR was written. A difference surface was created using a preliminary surface from H12416 and the combined surface. The mean difference was 1.8cm with a standard deviation of 11.7cm.

H12437

Sounding layers from H12437 and H12417 were compared using CARIS BathyDataBase and had a mean difference of 1.2cm with a standard deviation of 11cm.

H11044

No bathymetric data was provided for H11044. H12417 was compared to H11044 by performing a comparison between raster chart 12362 and a sounding layer generated by a combined 4 meter BASE surface from H12417. Compared soundings ranged from 96 feet to 132 feet and agreed to within 2 feet.

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

B.2.5.1None Exist

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

B.2.6.1 Shifting Sand Waves

Within H12417, an area in the southwestern portion of the sheet displayed significant sand wave patterns that appeared to shift during subsequent days of data acquisition. This is visible in the 50cm BASE surface as shown below.

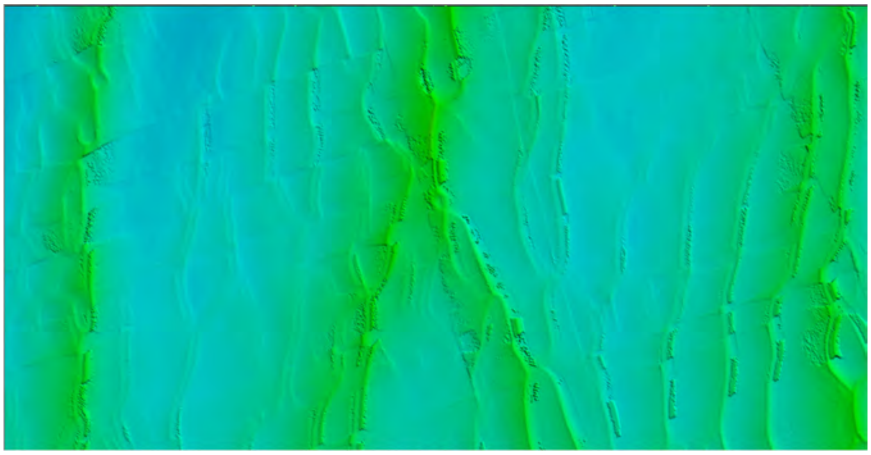

Figure 3: Shifting sand waves present in portion of H12417.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: S-222 conducts Moving Vessel Profiler casts approximately every 20 minutes. The launches conduct CTD casts approximately once every two hours. All sound velocity correctors were applied to the data using the "nearest in time" option in CARIS HIPS/SIPS.

Throughout the data acquisition phase of H12417, sound velocity profiles were inspected and trends noted. These trends showed a well mixed water column with little variation in sound velocity throughout the day. The inshore area was divided into rectangular polygons designed to be completed every two hours. This allowed for one CTD cast to be taken per polygon.

B.2.8 Coverage Equipment and Methods

99.47% of nodes in H12417 contained 5 or more soundings.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

HDCS sounding data were reduced to mean lower low water (MLLW) primarily with a VDATUM solution. Several lines were processed to TCARI when issues with ERS processing did not allow for an SBET solution. See the Vertical and Horizontal Control Section for more information.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.3.3 Trueheave Application

On DN153, lines 153_1708, 153_1716, 153_1723, a gap in POS/MV data acquisition occurred. Trueheave was not applied to these lines, but conditions were calm and the affected lines were compared to adjacent lines with Trueheave applied and found to agree well. The hydrographer recommends that the lines be treated normally in further processing and sounding selection.

B.4 Backscatter

Backscatter was logged as a 7k file and submitted to the IOCM processing center and/or directly to NGDC, and is not included with the data submitted to the Branch.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: NOAAProfileField.xml v. 5.2

B.5.2 Surfaces

The following CARIS surfaces were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12417_50cm_CUBE_MLLW	CUBE	0.5 meters	1.31 meters - 20 meters	NOAA_0.5m	Complete MBES
H12417_2m_CUBE_MLLW	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12417_4m_CUBE_MLLW	CUBE	4 meters	35 meters - 42.35 meters	NOAA_4m	Complete MBES
H12417_4m_CUBE_MLLW_Combined_Final	CUBE	4 meters	1.31 meters - 42.35 meters	NOAA_32m	Complete MBES

Table 9: CARIS Surfaces

The final submitted surfaces is a combined surface of the first three submitted surfaces. It was combined using the FPM recommended combine rules in CARIS BathyDataBASE.

C. Vertical and Horizontal Control

As per FPM section 5.2.3.2.3, no HVCR was filed as horizontal or vertical control stations were not established by the field party for this survey. A summary of horizontal and vertical control for this survey follows.

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

Standard Vertical Control Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
New Haven, CT	8465705
Bridgeport, CT	8467150
Kings Point, NY	8516945

Table 10: NWLON Tide Stations

File Name	Status
8465705.tid	Final Approved
8467150.tid	Final Approved
8516945.tid	Final Approved

Table 11: Water Level Files (.tid)

File Name	Status
B340TJ2012_Rev.tc	Final

Table 12: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 06/12/2012. The final tide note was received on 07/31/2012.

Non-Standard Vertical Control Methods Used:

VDatum

Ellipsoid to Chart Datum Separation File:

Crosslines with and without SBETs applied were compared using Pydro's Time Series Comparison tool. Results of the comparison were: N,mean,stdev = 49994, 0.038, 0.049. See Appendix V for the interim deliverable memo and resulting VDATUM approval memo.
The majority, 98%, of H12417 was processed using SBETs. The majority of these lines were then processed to the ellipsoid and reduced to MLLW using the OPs provided VDATUM separation model to reduce data to MLLW.

The remaining 2% of lines from H12299 did not have SBETs applied (therefore no GPS tides were applied) and instead were processed with TCARI tides:
Launch 3101: DN140, line: 140_1845;
DN141, line: 141_1737;
DN143, line: 143_2033;
DN151, line: 151_1707;
DN153, lines: 153_1704, 153_1708, 153_1716, 153_1723, 153_1725, 153_1734,
153_1817, 153_1958.
Launch 3102: DN158, line: 158_1453, 158_2031, 158_2124.

Additionally, many of the lines have SBET and RMS correctors applied, but do not use GPS tides based inconsistencies in the vertical component of the SBET. Where this occurred, lines were re-merged with TCARI as the vertical corrector. For a listing of all lines utilizing TCARI, see Appendix V, file "H12417 TCARI lines.xlsx".

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The following PPK methods were used for horizontal control:

Smart Base

The following CORS Stations were used for horizontal control:

HVCR Site ID	**Base Station ID**
NYRH	NYRH
CTDA	CTDA
CTGU	CTGU
MOR5	MOR5
MOR6	MOR6
NYCI	NYCI
ZNY1	ZNY1
NYRH	NYRH
RVDI	RVDI

Table 13: CORS Base Stations

The following DGPS Stations were used for horizontal control:

DGPS Stations
Moriches, NY
Acushnet, MA

Table 14: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
12354	1:80000	43	09/2010	08/24/2012	09/04/2012
12362	1:10000	17	02/2005	02/15/2005	02/19/2005

Table 15: Largest Scale Raster Charts

<u>12354</u>

Soundings from H12417 agreed well, within 2 feet, of charted soundings on raster chart 12354. There are several rocky areas that are not accurately charted but they are reflected in the FFF.

<u>12362</u>

Charted soundings generally agreed very well, within 1 foot of surveyed soundings. In the southwest corner of H12417, multiple rocks were discovered causing surveyed soundings to disagree with charted soundings by 6 to 10 feet.

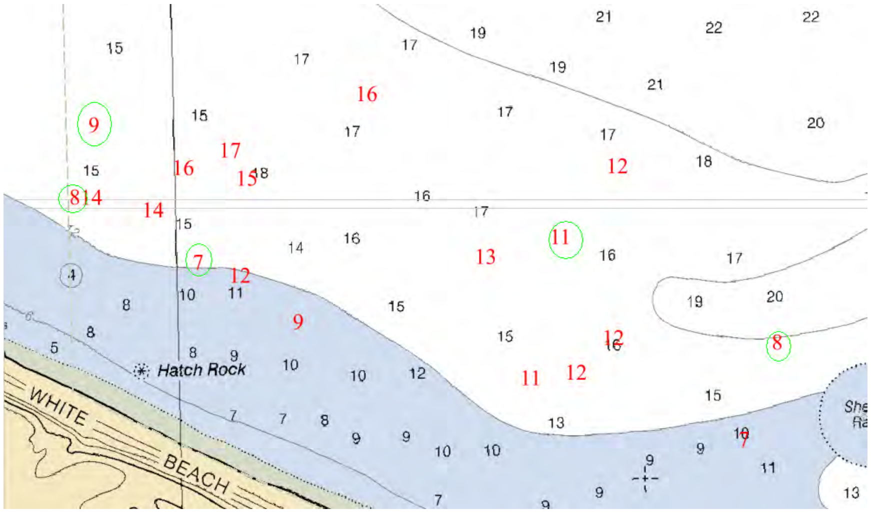

Figure 6: Southwest corner of H12417 showing designated soundings on rocks.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	**Scale**	**Edition**	**Update Application Date**	**Issue Date**	**Preliminary?**
US4NY1GM	1:80000	20	08/25/2008	07/11/2011	NO
US5NY17M	1:10000	7	03/03/2011	03/03/2011	NO
US5CN10M	1:40000	2	10/02/2012	10/02/2012	NO

Table 16: Largest Scale ENCs

US4NY1GM

Charted soundings on ENC US4NY1GM agreed within 3 feet of surveyed soundings. There are several rocky areas that are not accurately charted but they are reflected in the FFF.

US5NY17M

Charted soundings from ENC US5NY17M generally agreed very well, within 1 foot of surveyed soundings. In the southwest corner of H12417, multiple rocks were discovered causing surveyed soundings to disagree with charted soundings by 6 to 10 feet. (See figure 6).

US5CN10M

Charted soundings from ENC US5CN10M generally agreed well, within 2 feet of surveyed soundings. There are several rocky areas that are not accurately charted but they are reflected in the FFF.

D.1.3 AWOIS Items

Number of AWOIS Items Addressed: 2
Number of AWOIS Items Not Addressed: 0

The survey contained two assigned AWOIS items and both were fully investigated.
AWOIS item #11825, a position approximate, 18 ft obstruction of shellfish racks was disproved by H12417.
AWOIS item #1766, a charted underwater wreck with a wire dragged depth of 64ft was found by by H12417. A new feature was created to show accurate position and least depth.

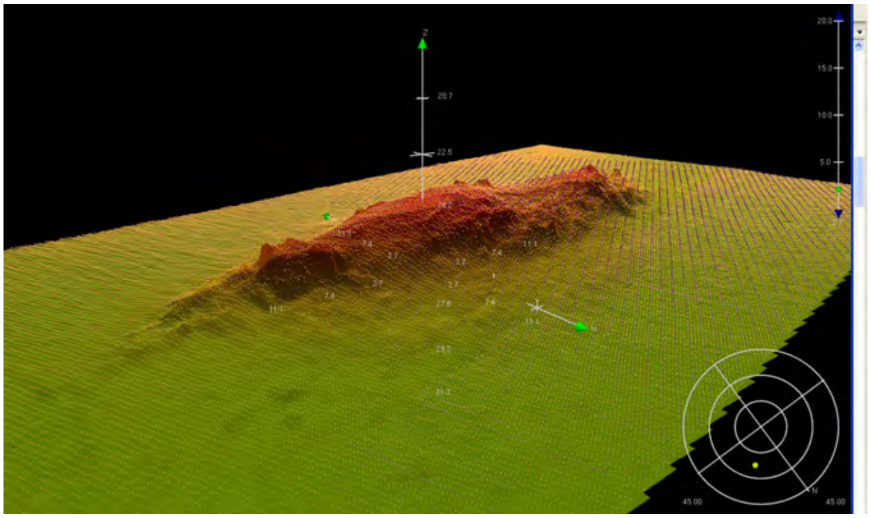

Figure 7: AWOIS item #1766, charted wreck located by H12417, least depth found to be 78ft.

D.1.4 Charted Features

See AWOIS section.

D.1.5 Uncharted Features

No uncharted features exist for this survey.

D.1.6 Dangers to Navigation

The follwing DTON reports were submitted to the processing branch:

DTON Report Name	Date Submitted
H12417 DtoNs	2012-10-04

Table 17: DTON Reports

Danger to Navigation Reports are included in Appendix I of this report.

D.1.7 Shoal and Hazardous Features

An area of rocks in the SW corner of the sheet exists. Two of these rocks were reported as DtoNs and the others have been designated as rock features.

D.1.8 Channels

No channels exist for this survey. There are no designated anchorages, precautionary areas, safety fairways, traffic separation schemes, pilot boarding areas, or channel and range lines within the survey limits.

D.2 Additional Results

D.2.1 Shoreline

Shoreline was assigned in the Hydrographic Survey Project Instructions or Statement of Work, but was not investigated.

D.2.2 Prior Surveys

Prior survey comparisons exist for this survey, but were not investigated.

D.2.3 Aids to Navigation

Three AtoNs exist within the survey limits of H12417. All three AtoNs were confirmed to be functioning and positioned correctly.

D.2.4 Overhead Features

Overhead features do not exist for this survey.

D.2.5 Submarine Features

A cable area exists within the sheet limits, but evidence of cables on the sea floor was not detected in the MBES data. All cables are presumed to be properly buried.

D.2.6 Ferry Routes and Terminals

No ferry routes or terminals exist for this survey.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

In the eastern, central portion of the sheet near the AtoN GC "9," an area of shifting sand waves was noticed during the survey. The FFF outlines the limits of the sandwaves.

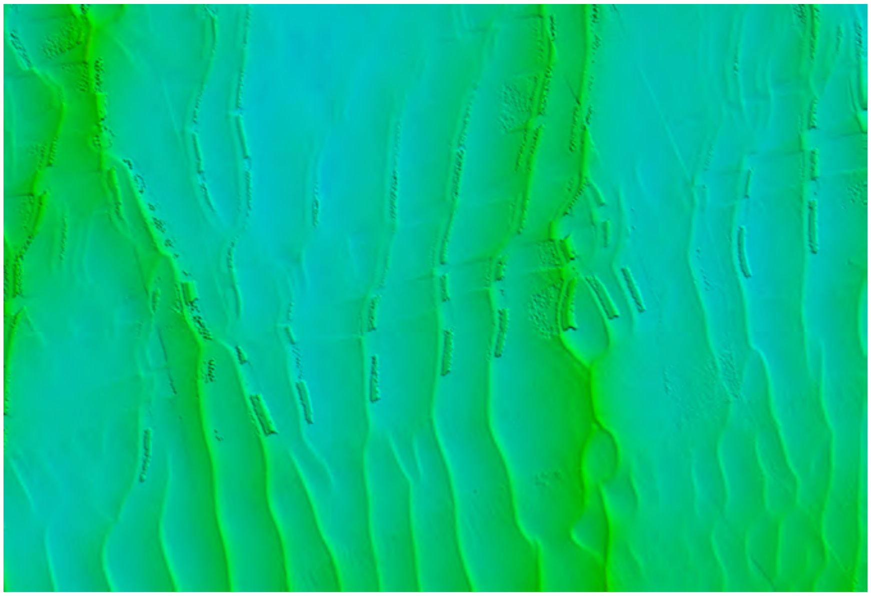

Figure 9: Sand wave activity noticed during acquisition of H12417.

D.2 Construction and Dredging

There is no present or planned construction or dredging within the survey limits.

E. Approval Sheet

As Chief of Party, Field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	Approver Title	Approval Date	Signature
ENS Andrew Clos	Sheet Manager	03/22/2013	
LT William Winner	Field Operations Officer	03/22/2013	
CDR Lawrence Krepp	Commanding Officer	03/22/2013	

F. Table of Acronyms

Acronym	**Definition**
AFF	Assigned Features File
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSDM	Hydrographic Survey Specifications and Deliverables Manual

Acronym	**Definition**
HSTP	Hydrographic Systems Technology Programs
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	**Definition**
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Porpagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Exectutive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

H12416

U.S. Department of Commerce
National Oceanic and Atmospheric Administration
National Ocean Survey

DESCRIPTIVE REPORT

Type of Survey:	Navigable Area
Registry Number:	H12416

LOCALITY

State(s):	New York
General Locality:	Long Island Sound
Sub-locality:	Crane Neck Pt to Port Jefferson, NY

2012

CHIEF OF PARTY
CDR Lawrence T. Krepp NOAA

LIBRARY & ARCHIVES

Date:

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION

REGISTRY NUMBER:

HYDROGRAPHIC TITLE SHEET

H12416

INSTRUCTIONS: The Hydrographic Sheet should be accompanied by this form, filled in as completely as possible, when the sheet is forwarded to the Office.

State(s):	**New York**
General Locality:	**Long Island Sound**
Sub-Locality:	**Crane Neck Pt to Port Jefferson, NY**
Scale:	**5000**
Dates of Survey:	**06/06/2012 to 06/28/2012**
Instructions Dated:	**05/08/2012**
Project Number:	**OPR-B340-TJ-12**
Field Unit:	**NOAA Ship *Thomas Jefferson***
Chief of Party:	**CDR Lawrence T. Krepp NOAA**
Soundings by:	**Multibeam Echo Sounder**
Imagery by:	**Multibeam Echo Sounder Backscatter**
Verification by:	**Atlantic Hydrographic Branch**
Soundings Acquired in:	**meters at Mean Lower Low Water**

Remarks:

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Descriptive Report to Accompany Survey H12416

Project: OPR-B340-TJ-12
Locality: Long Island Sound
Sublocality: Crane Neck Pt to Port Jefferson, NY
Scale: 1:5000
June 2012 - June 2012
NOAA Ship *Thomas Jefferson*
Chief of Party: CDR Lawrence T. Krepp NOAA

A. Area Surveyed

This hydrographic survey was completed as specified by Hydrographic Survey Project Instructions OPR-B340-TJ-12 and all other applicable directions. The survey area is located on the northern shore of Long Island, NY, extending from Crane Neck Point in the west, eastward to White Beach and includes Port Jefferson Harbor.

A.1 Survey Limits

Data were acquired within the following survey limits:

Northwest Limit	Southeast Limit
41° 1" 45' N 73° 3" 37' W	40° 56" 44' N 73° 10" 3' W

Table 1: Survey Limits

Survey Limits were acquired in accordance with the requirements in the Project Instructions and the HSSD.

A.2 Survey Purpose

This project is being conducted in support of NOAA's Office of Coast Survey to provide contemporary hydrographic data in order to update the nautical charting products and reduce the survey backlog within the area. In addition, data from this project will support the Long Island Sound Seafloor Mapping Initiative for the States of Connecticut and New York. This project also responds to the Coast Guard proposal to establish six anchorage grounds in Long Island Sound to increase safety for vessels through enhanced voyage planning and also by clearly indicating the location of anchorage grounds for ships proceeding to ports in New York. The USCG is requesting that NOAA confirm that their underwater surveys of Long

Island Sound did not detect any wrecks at all in the locations being proposed for the anchorage areas. Data acquired for this project will be used by partners for species and habitat identification, infrastructure projects, ocean mapping, coastal hazards and geology. Partners include the US Environmental Protection Agency, Connecticut Department of Environmental Protection, the University of Connecticut Marine Science Department, New York Department of Environmental Quality, and other organizations.

A.3 Survey Quality

The entire survey is adequate to supersede previous data.

A.4 Survey Coverage

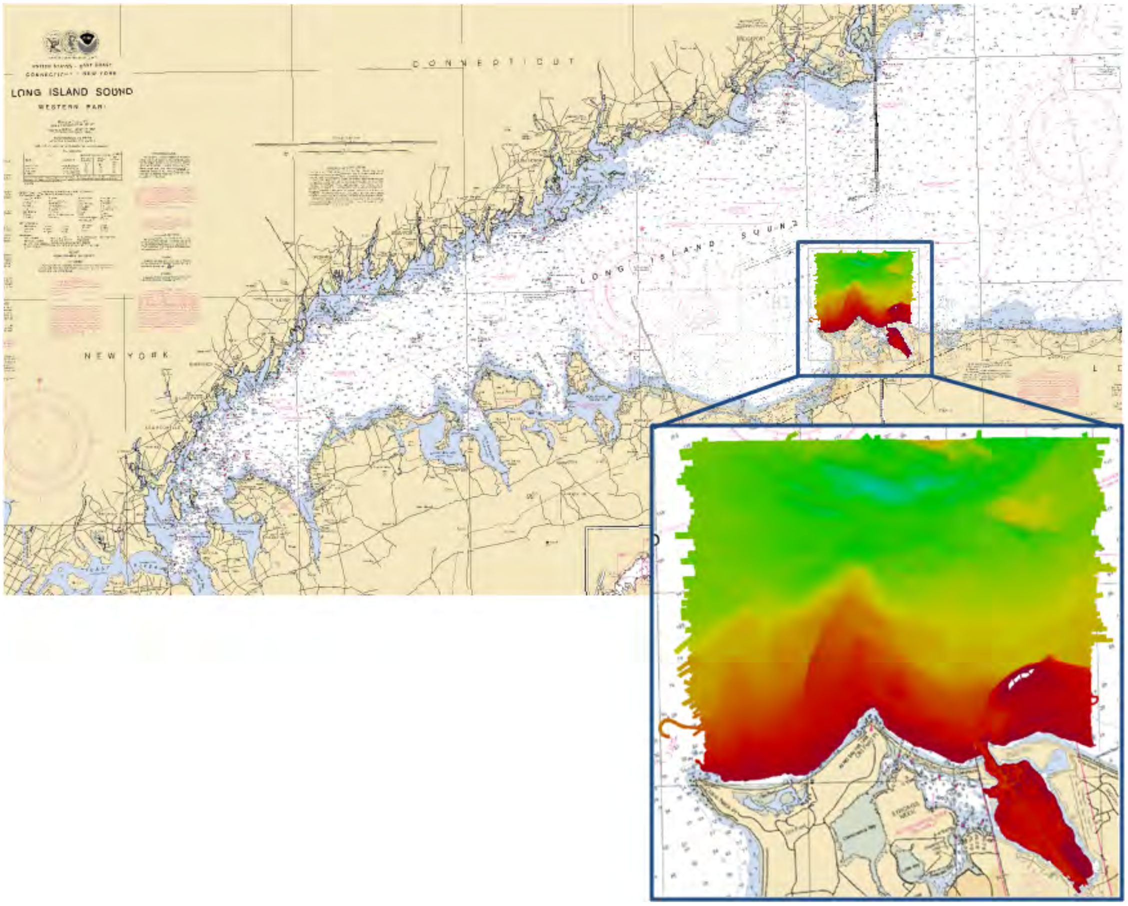


Figure 1: Location of survey H12416.

Coverage holidays do exist for this survey. Please see section B.2.10 for more information on the subject.

A.5 Survey Statistics

The following table lists the mainscheme and crossline acquisition mileage for this survey:

	HULL ID	***HSL 3101***	***HSL 3102***	***S-222***	***Total***
LNM	**SBES Mainscheme**	0.00	0.00	0.00	0.00
	MBES Mainscheme	241.39	311.97	254.71	808.07
	Lidar Mainscheme	0.00	0.00	0.00	0.00
	SSS Mainscheme	0.00	0.00	0.00	0.00
	SBES/MBES Combo Mainscheme	0.00	0.00	0.00	0.00
	SBES/SSS Combo Mainscheme	0.00	0.00	0.00	0.00
	MBES/SSS Combo Mainscheme	0.00	0.00	0.00	0.00
	SBES/MBES Combo Crosslines	6.02	22.57	7.76	36.35
	Lidar Crosslines	0.00	0.00	0.00	0.00
Number of Bottom Samples					21
Number AWOIS Items Investigated					4
Number Maritime Boundary Points Investigated					0
Number of DPs					5
Number of Items Items Investigated by Dive Ops					0
Total Number of SNM					14.49

Table 2: Hydrographic Survey Statistics

The following table lists the specific dates of data acquisition for this survey:

Survey Dates	Julian Day Number
06/06/2012	158
06/07/2012	159
06/08/2012	160
06/09/2012	161
06/10/2012	162
06/11/2012	163
06/12/2012	164
06/13/2012	165
06/19/2012	171
06/20/2012	172
06/21/2012	173
06/22/2012	174
06/23/2012	175
06/24/2012	176
06/25/2012	177
06/26/2012	178
06/28/2012	180

Table 3: Dates of Hydrography

B. Data Acquisition and Processing

B.1 Equipment and Vessels

Refer to the Data Acquisition and Processing Report (DAPR) for a complete description of data acquisition and processing systems, survey vessels, quality control procedures and data processing methods. Additional information to supplement sounding and survey data, and any deviations from the DAPR are discussed in the following sections.

B.1.1 Vessels

The following vessels were used for data acquisition during this survey:

Hull ID	***S-222***	***HSL 3101***	***HSL 3102***
LOA	208 feet	31 feet	31 feet
Draft	15 feet	5.2 feet	5.2 feet

Table 4: Vessels Used

S-222 acquired Multibeam data, Sound Velocity data, and Attitude data. HSL 3101 acquired Multibeam data, Sound Velocity data, and Attitude data. HSL 3102 acquired Multibeam data, Sound Velocity data, Attitude data, and bottom samples.

B.1.2 Equipment

The following major systems were used for data acquisition during this survey:

Manufacturer	Model	Type
Reson	7125 ROV	MBES
Reson	SVP71	Sound Speed System
Applanix	POS/MV V4	Positioning and Attitude System
Sea Bird	SBE 19 plus	Conductivity, Temperature and Depth Sensor
Brooke Ocean Technology	MVP100	Sound Speed System
Reson	7125 SV	MBES
Applied Micro Systems	Smart SV + T SSVS	Sound Speed System
Trimble	SPS351	Positioning System

Table 5: Major Systems Used

Vessel configurations, equipment operations, and data acquisition & processing were consistent with specifications described in the DAPR.

B.2 Quality Control

B.2.1 Crosslines

Crosslines, acquired for this survey, totalled 4.5% of mainscheme acquisition.

Crosslines were collected, processed and compared in accordance with section 5.2.4.3 of the HSSD (ed. 2012). All crosslines were filtered to 45 degrees on both sides and surface differencing in CARIS HIPS and SIPS was used to assess crossline agreement with mainscheme lines. Figure 1 depicts the difference surface between the 2-meter mainscheme and 2-meter crosslines surfaces. The difference surface is submitted digitally in the Separates IV folder. Percentage of crosslines collected to mainscheme lines is 4.50%, which exceeded the requirements in the HSSD for complete multibeam surveys. The differences in crosslines to mainscheme were generally less than +/- 0.07 meters (Figure3). In addition the hydrographer investigated nodes in the difference surface that exceeds the IHO tolerance to ensure that these were due to noise in the data and not systematic errors.

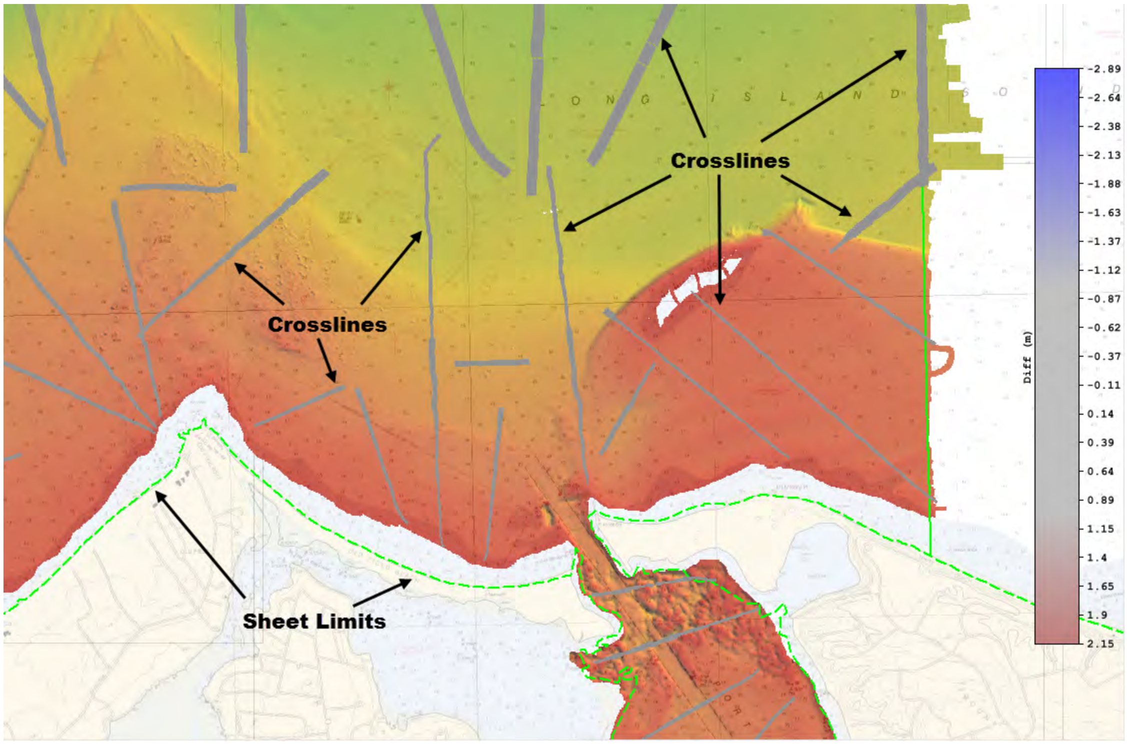
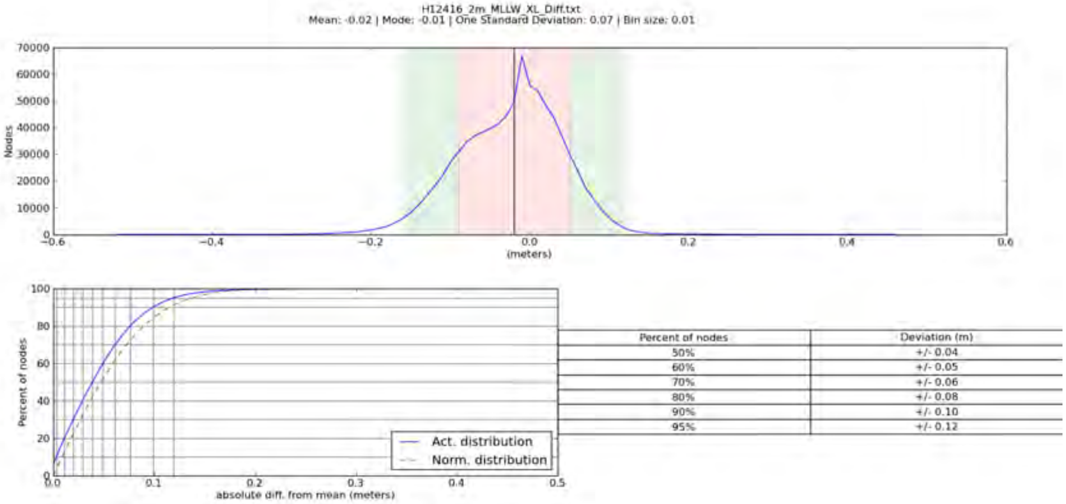


Figure 2: Mainscheme to crosslines difference surface.



Percent of nodes	Deviation (m)
50%	+/- 0.04
60%	+/- 0.05
70%	+/- 0.06
80%	+/- 0.08
90%	+/- 0.10
95%	+/- 0.12

Figure 3: Statistical representation of differences between crosslines and mainscheme surfaces.

B.2.2 Uncertainty

The following survey specific parameters were used for this survey:

Measured	Zoning
0.104 meters	0 meters

Table 6: Survey Specific Tide TPU Values

Hull ID	Measured - CTD	Measured - MVP	Surface
HSL 3101	4 meters/second		0.2 meters/second
HSL 3102	4 meters/second		0.2 meters/second
S222		1 meters/second	0.2 meters/second

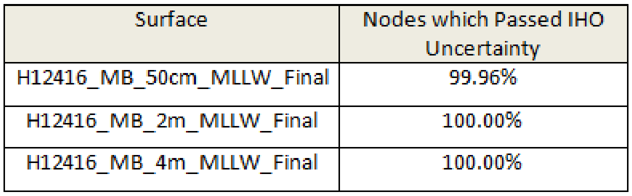
Table 7: Survey Specific Sound Speed TPU Values

For data processed to the ellipsoid, uncertainty was derived using a combination of a priori values for equipment and vessel characteristics, in combination with real time uncertainties for vessel motion, as well as field assigned values for sound speed uncertainties. The a priori values were set in accordance with Appendix 4, table 4.9 of the NOAA Field Procedure Manual (ed 2012). Vessel position and attitude were calculated using IAPPK data. Uncertainties associated with the speed of sound were entered by the field unit in accordance with guidance from Appendix 4 of the FPM.

Total Propagated Uncertainty was evaluated to ensure compliance with Section 5.1.3 of NOAA's HSSD (ed 2012). A ratio between actual uncertainty and maximum allowed uncertainty is found for each node. An IHO TVU layer (named IHO_1) was created in the finalized surface in each depth band (50cm, 2m, and 4m respectively) by calculating the ratio of the uncertainty at the node to the maximum allowed IHO uncertainty for each node. Because this entire survey falls within IHO Order 1 the calculation was -Uncertainty/((0.5^2 +((Depth*0.013)^2))^0.5). As a result any values less than than -1 would indicate that the node exceeded the specifications in regards to total vertical uncertainty.

The resulting 'IHO_1' layer was filtered using a color map to show any areas where actual uncertainty exceeded the maximum allowed uncertainty. Areas which failed were typically found around boulders and rocky seabed areas. These are places where higher uncertainty would be expected. Figure 4 shows the percentage of nodes which met the IHO S-44 Order I requirements.

A higher uncertainty in the 50cm finalized grid was noted in the northwest section of the surface. The uncertainty of these nodes are attributed to sound velocity errors. These errors do not exceed specifications outlined in the HSSD (2012 ed).



Surface	Nodes which Passed IHO Uncertainty
H12416_MB_50cm_MLLW_Final	99.96%
H12416_MB_2m_MLLW_Final	100.00%
H12416_MB_4m_MLLW_Final	100.00%

Figure 4: Percentage of nodes within IHO S-44 Order 1 Requirements

B.2.3 Junctions

The areas of overlap between survey H12416 and adjacent junction surveys were reviewed for sounding consistency in CARIS Subset Editor and by surface differencing either the 2 meter or 4 meter combined surfaces to assess surface agreement.

The following junctions were made with this survey:

Registry Number	Scale	Year	Field Unit	Relative Location
H11044	1:20000	2001	NOAA Ship RUDE	NE
H11045	1:20000	2003	NOAA Ship RUDE	NW
H12417	1:5000	2012	NOAA Ship THOMAS JEFFERSON	E
H12488	1:10000	2012	NOAA Ship THOMAS JEFFERSON	W

Table 8: Junctioning Surveys

H11044

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between H12416_4m_Combined surface and H11044_2 surface. The H11044_2 surface was created from the H11044_2m_xyz.txt file provided to the ship in the Project Instructions and used in lieu of a H11044 combined surface. Nodes generally agree within 0.16m with 95% of the nodes agreeing with +/- 4.02m. Areas of larger differences are believed to be caused by the comparison between single-beam (H11044) and multi-beam (H12416). See Figure 5 for a graphical representation and Figure 6 for statistical information of the surface differencing.

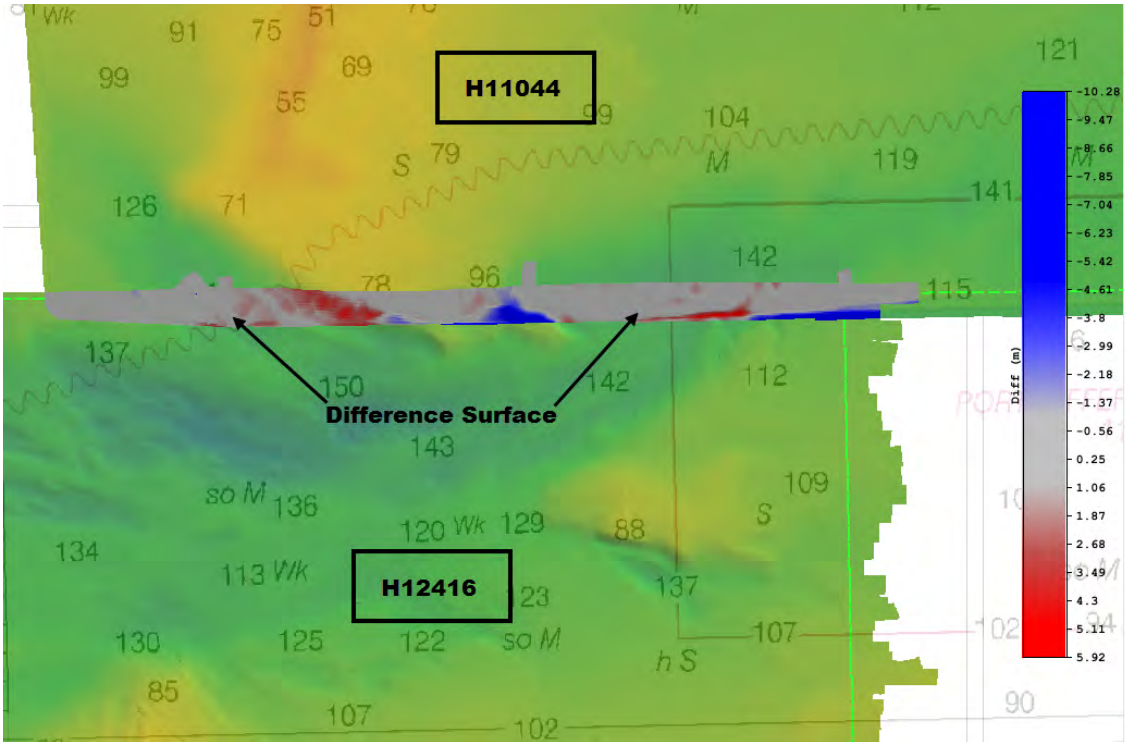
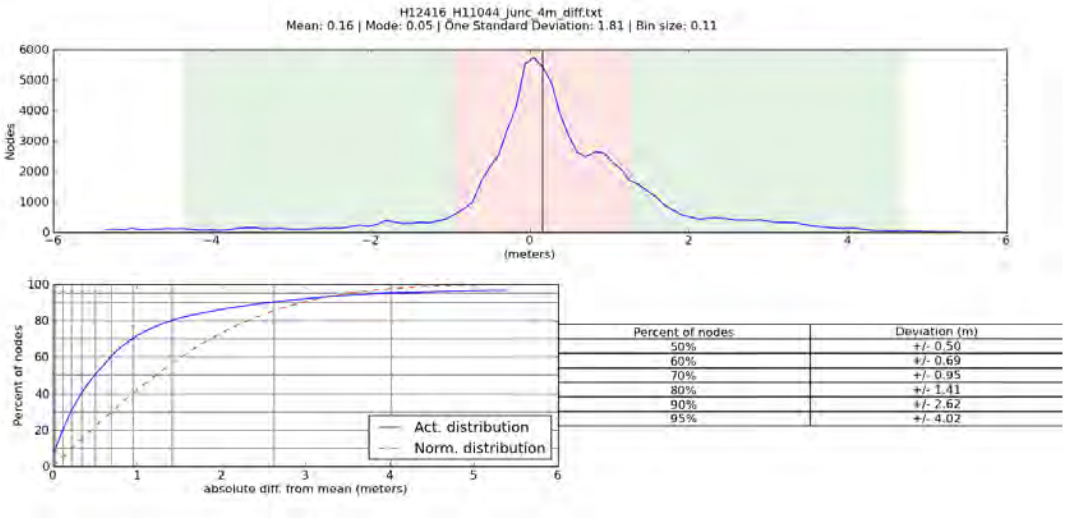


Figure 5: Graphical representation of junction comparison between H12416 and H11044.



Percent of nodes	Deviation (m)
50%	+/- 0.50
60%	+/- 0.69
70%	+/- 0.95
80%	+/- 1.41
90%	+/- 2.62
95%	+/- 4.02

Figure 6: Statistical representation of junction comparison between H12416 and H11044.

H11045

The ship was not provided with a usable file format for a junction survey comparison; therefore, a comparison with H11045 was not performed.

H12417

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between H12416_4m_Combined surface and H12417_4m_CUBE_MLLW_Final_Combined surface. The mean difference of this survey was 0 meters with 95% of nodes agreeing within +/- 0.15 m. See Figure 7 for a graphical representation and Figure 8 for statistical information of the surface differencing.

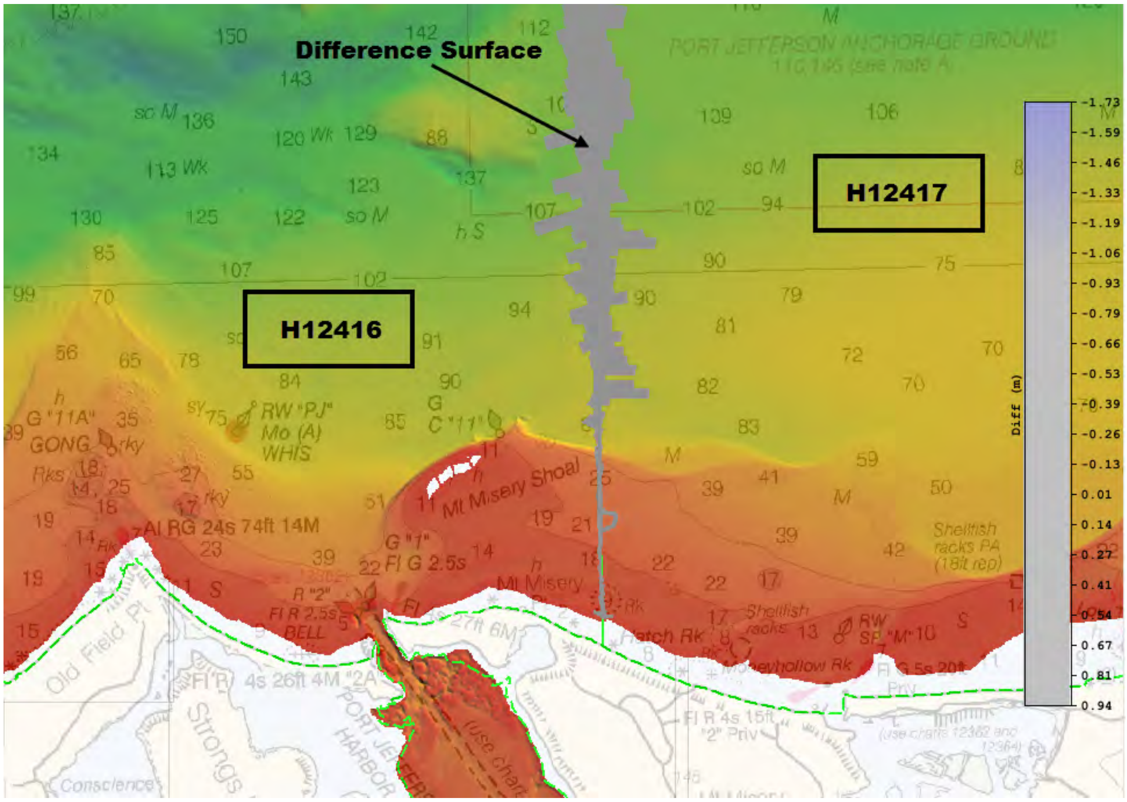
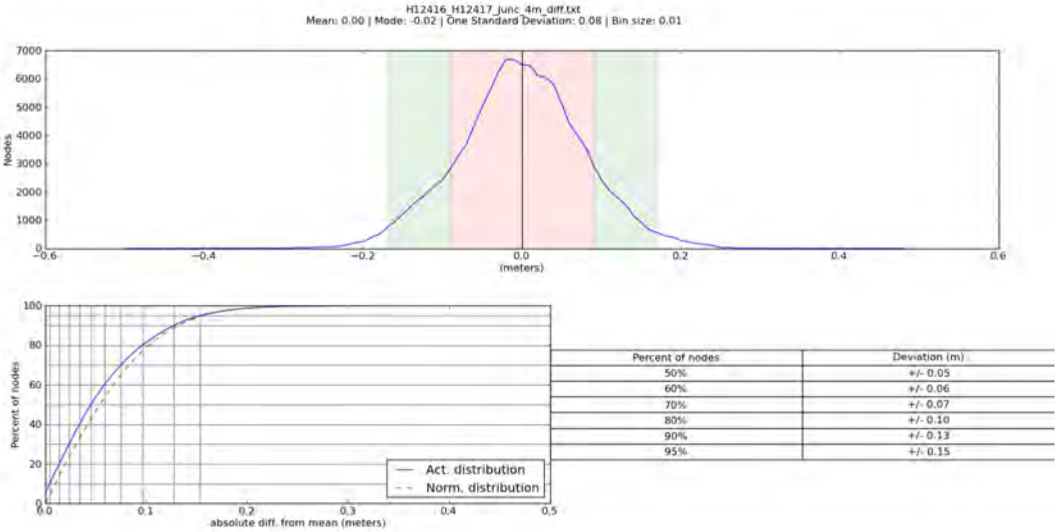


Figure 7: Graphical representation of junction comparison between H12416 and H12417.



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.10
90%	+/- 0.13
95%	+/- 0.15

Figure 8: Statistical representation of junction comparison between H12416 and H12417.

<u>H12488</u>

Surface differencing in CARIS HIPS and SIPS was used to assess junction agreement between H12416_MB_2m_MLLW_Final surface and H12488_Comb_2m_MLLW surface. It should be noted that survey H12488 has not yet been submitted for acceptance and the H12488_Comb_2m_MLLW surface used is a preliminary surface. However, the surfaces compared well; the mean difference between the surfaces was 0.01 meters with 95% of nodes agreeing within +/- 0.13m. See Figure 9 for a graphical representation and Figure 10 for statistical information of the surface differencing.

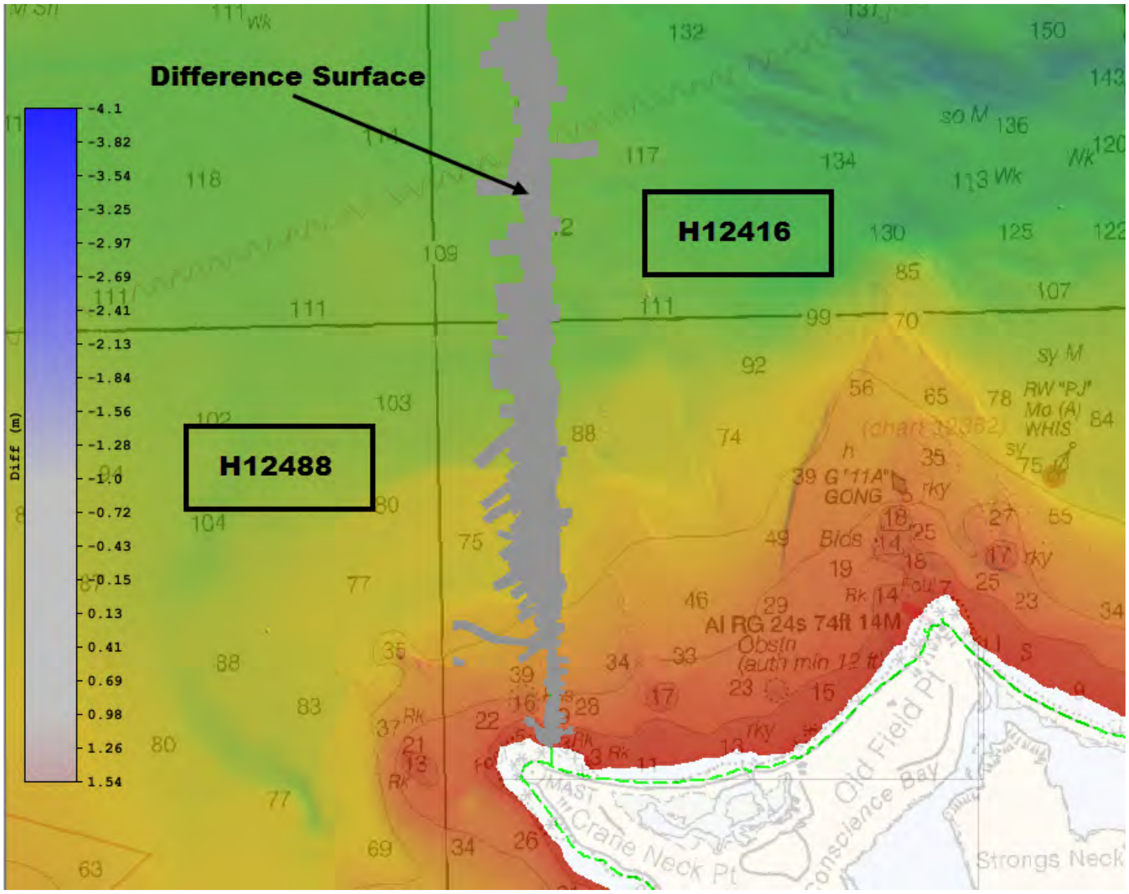
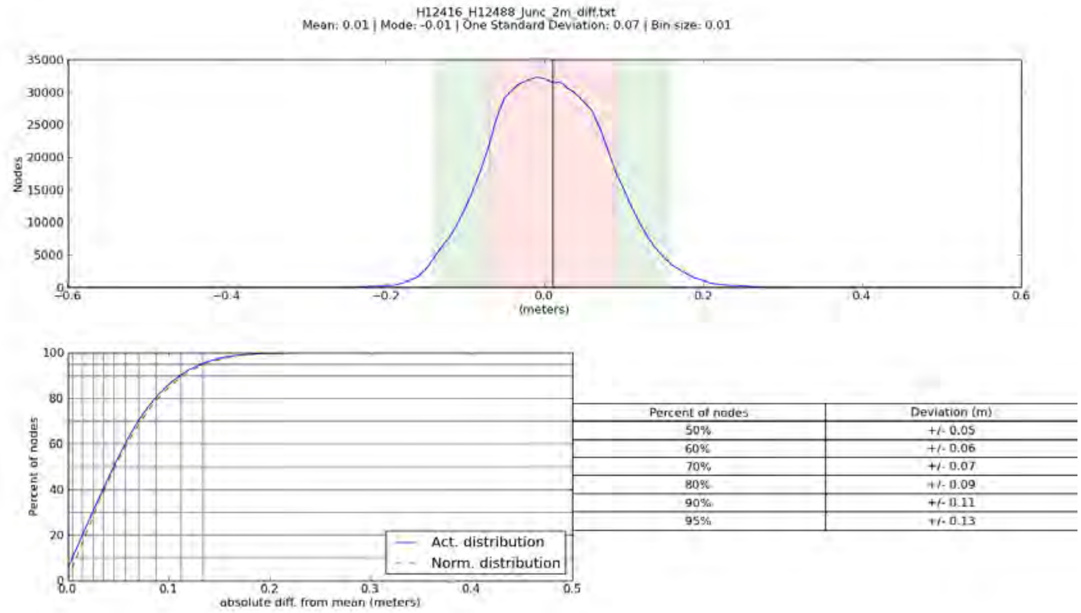


Figure 9: Graphical representation of junction comparison between H12416 and H12488



Percent of nodes	Deviation (m)
50%	+/- 0.05
60%	+/- 0.06
70%	+/- 0.07
80%	+/- 0.09
90%	+/- 0.11
95%	+/- 0.13

Figure 10: Statistical representation of junction comparison between H12416 and H12488

B.2.4 Sonar QC Checks

Sonar system quality control checks were conducted as detailed in the quality control section of the DAPR.

B.2.5 Equipment Effectiveness

There were no conditions or deficiencies that affected equipment operational effectiveness.

B.2.6 Factors Affecting Soundings

There were no other factors that affected corrections to soundings.

B.2.7 Sound Speed Methods

Sound Speed Cast Frequency: HSL 3101 and 3102 acquired sound speed profiles by using SBE-19 plus CTDs at discrete locations within the survey area generally once every four hours. S-222 utilized a Moving Vessel Profiler (MVP-100) for collecting sound speed profiles approximately once every 30 minutes.

Casts were grouped by vessel and applied within CARIS using the application method of "Nearest in Time". An exception to this application method was Vessel 3101 on DN 161, which utilized "Nearest in Distance within 2 hours".

On June 24, 2012 (DN176), Launch 3102 was tasked with Crosslines. No cast was obtained in the deep water, depths were in the range of 150ft plus. No other cast was available from any other platform that day. The closest cast for that depth was from S222 on DN 177. The cast name, from MVP, is H12416_3102_177_2018deep.svp. A comparison cast was performed on available casts from junction surveys. These were on the east and west side of H12416. At 50 degrees, the casts were acceptable on successive days. Nearest in distance was used for the single svp correction. The lines were then filtered to 50 degrees that will facilitate infrequent cast acquisition. TPU for Launch (CTD) was computed at 4m/sec for those lines based on frequency of cast. The cast comparison was as follows:

```
Wed Dec 12 16:30:37 2012
COMPARE 2 FILES
RESULTS: PERCENT DEPTH DIFFERENCE OK
SUMMARY OF RESULTS - COMPARE 2 CASTS   VELOCIPY, Version      12.9
REFERENCE PROFILE:     H12415_S222_175_183100.VPQ
COMPARISON PROFILE:    H12488_S222_177_201800.VPQ
REFERENCE INSTRUMENT:  SBE19PLUS (SN:6667)
COMPARISON INSTRUMENT: SBE19PLUS (SN:6667)
DRAFT                              = 0.80m
MAXIMUM COMMON DEPTH               = 32.00
MAXIMUM DEPTH PERCENTAGE DIFFERENCE = 0.23%
MAXIMUM PERCENTAGE DIFFERENCE AT    = 30.17m
Max percentage diff line and last line of travel time table:
Travel time, Avg Depth, Depth Diff, Pct Depth Diff, Avg Crosstrack, Crosstrack Diff, Pct Crosstrack Diff
0.03s ,    30.14m,    0.07m  ,      0.23%    ,       34.29m  ,       0.05m    ,          0.15%
0.03s ,    30.14m,    0.07m  ,      0.23%    ,       34.29m  ,       0.05m    ,          0.15%
```

Crosslines affected were 930-1658, 931-172, 932-1928, 933-1950, and 935-2052.

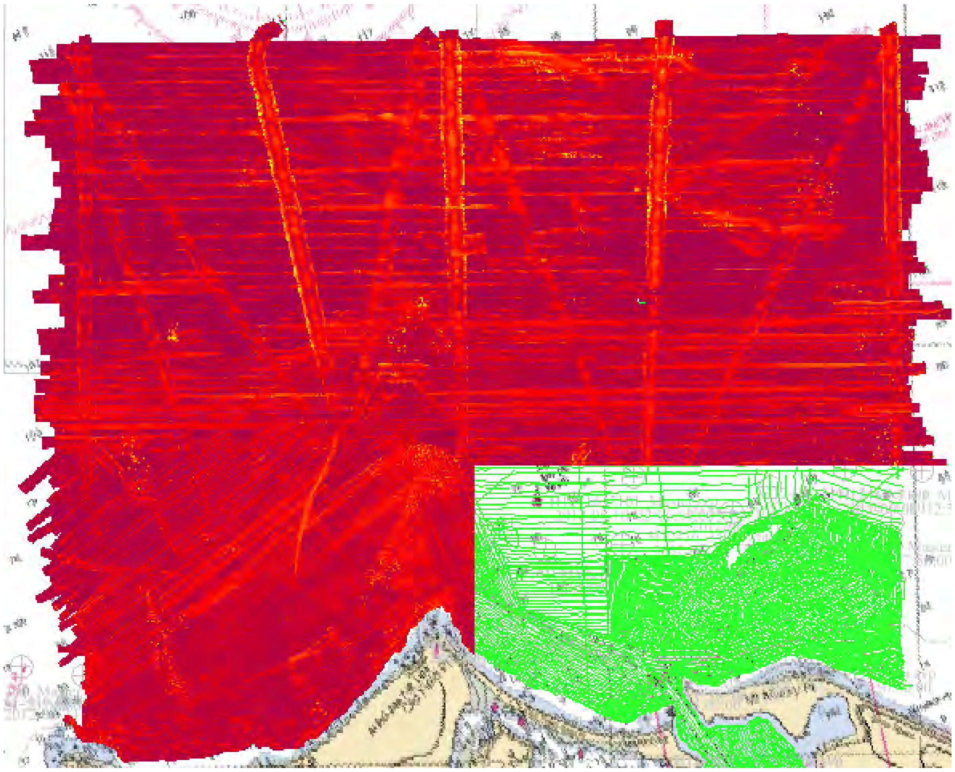
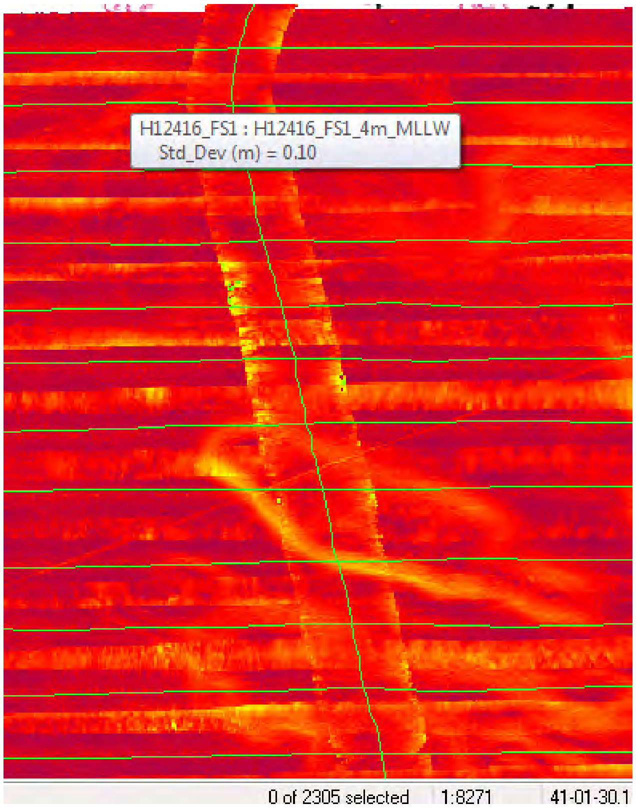


Figure 11: Crossline Standard Deviation Before



H12416_FS1 : H12416_FS1_4m_MLLW
Std_Dev (m) = 0.10

0 of 2305 selected 1:8271 41-01-30.1

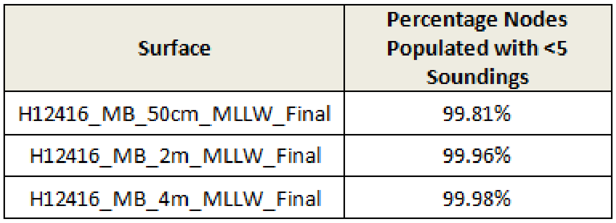
Figure 12: Crossline Standard Deviation After

B.2.8 Coverage Equipment and Methods

All equipment and survey methods were used as detailed in the DAPR.

B.2.9 Density

Survey H12416 met density requirements per the HSSD. Figure 13 highlights the percentage of nodes which contains five or more soundings.



Surface	Percentage Nodes Populated with <5 Soundings
H12416_MB_50cm_MLLW_Final	99.81%
H12416_MB_2m_MLLW_Final	99.96%
H12416_MB_4m_MLLW_Final	99.98%

Figure 13: Density Requirements

B.2.10 Coverage Holidays

Complete multibeam coverage was obtained within the limits of H12416. Holidays greater than three nodes did occur, generally in areas of depths less than 4-meters. The following are examples of coverage holidays.

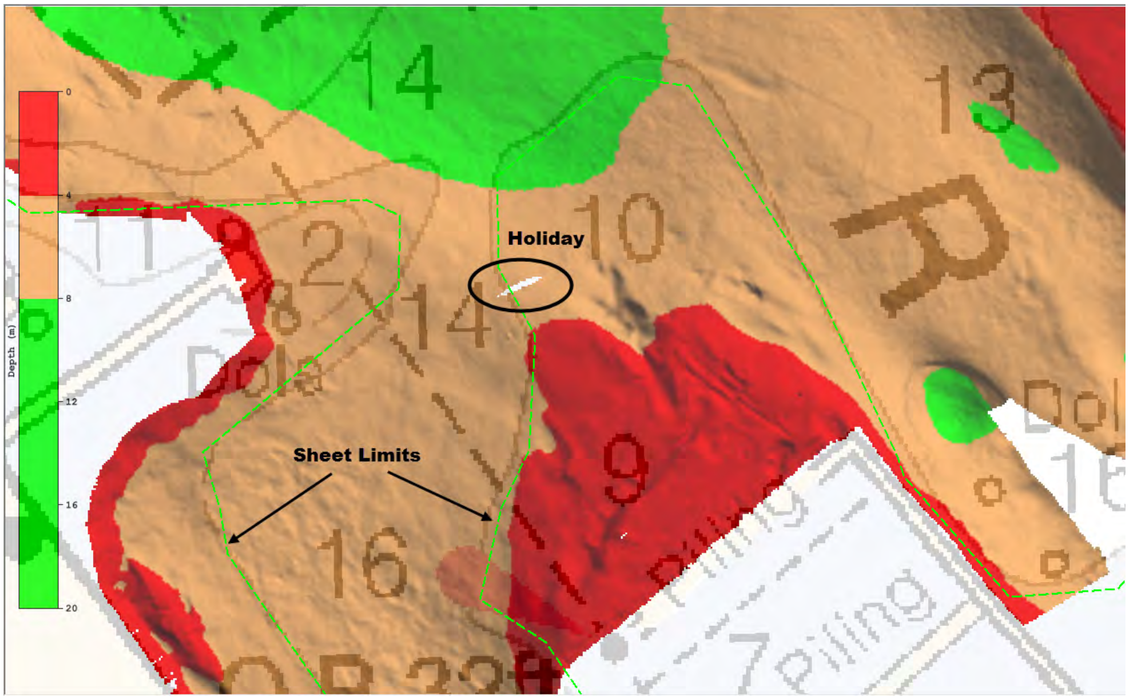


Figure 14: Coverage holiday NW of Port Jefferson ferry pier.

Figure 15: Multiple coverage holidays around mooring buoys inside 4-meter depth contour.

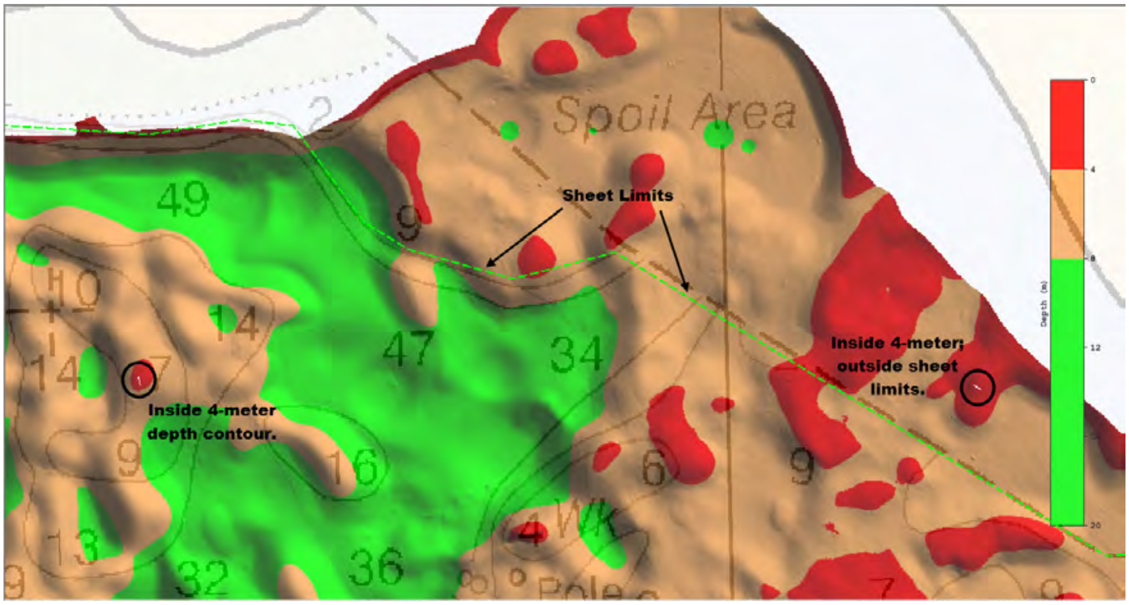


Figure 16: Coverage holidays inside 4-meter depth contour; NE Port Jefferson.

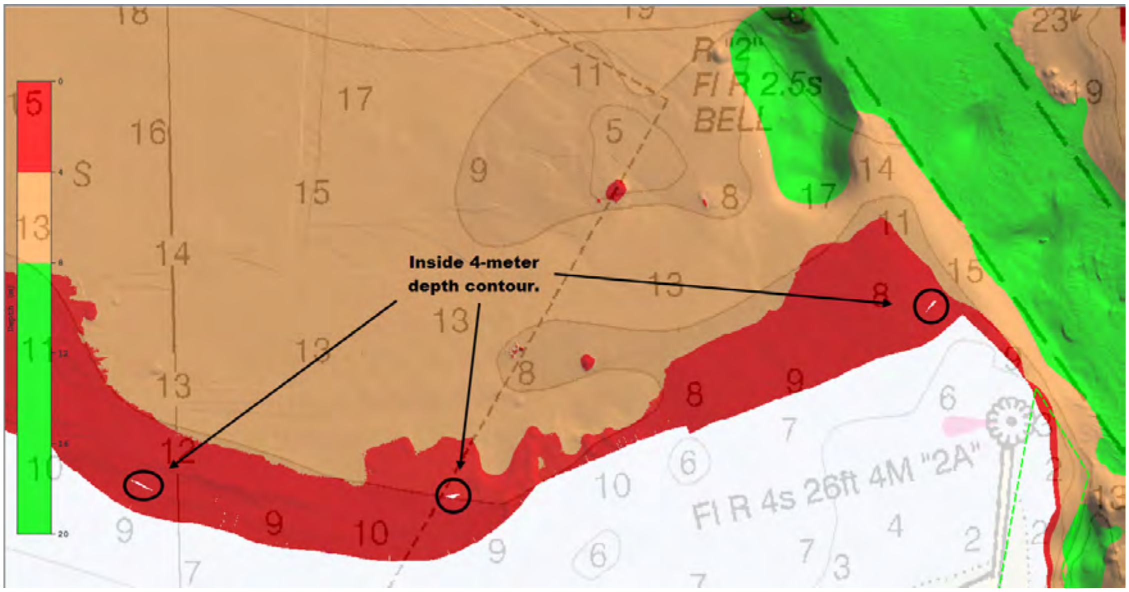


Figure 17: Multiple coverage holidays inside 4-meter depth contour; W of Port Jefferson entrance.

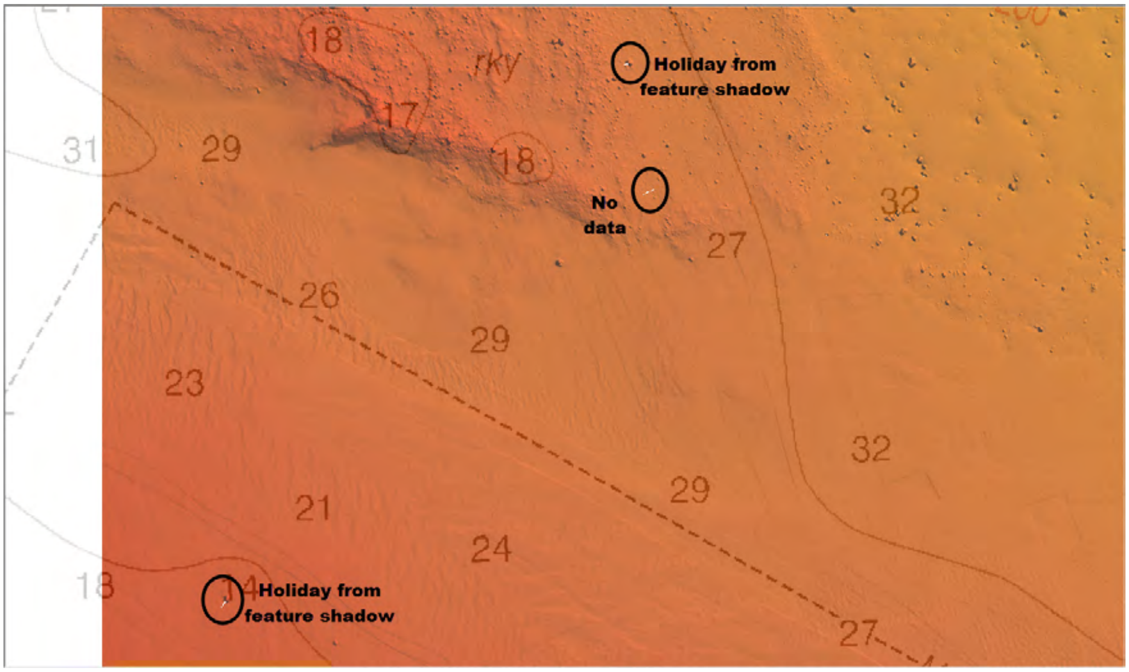


Figure 18: Coverage holidays caused by feature shadows; NW of Port Jefferson entrance.

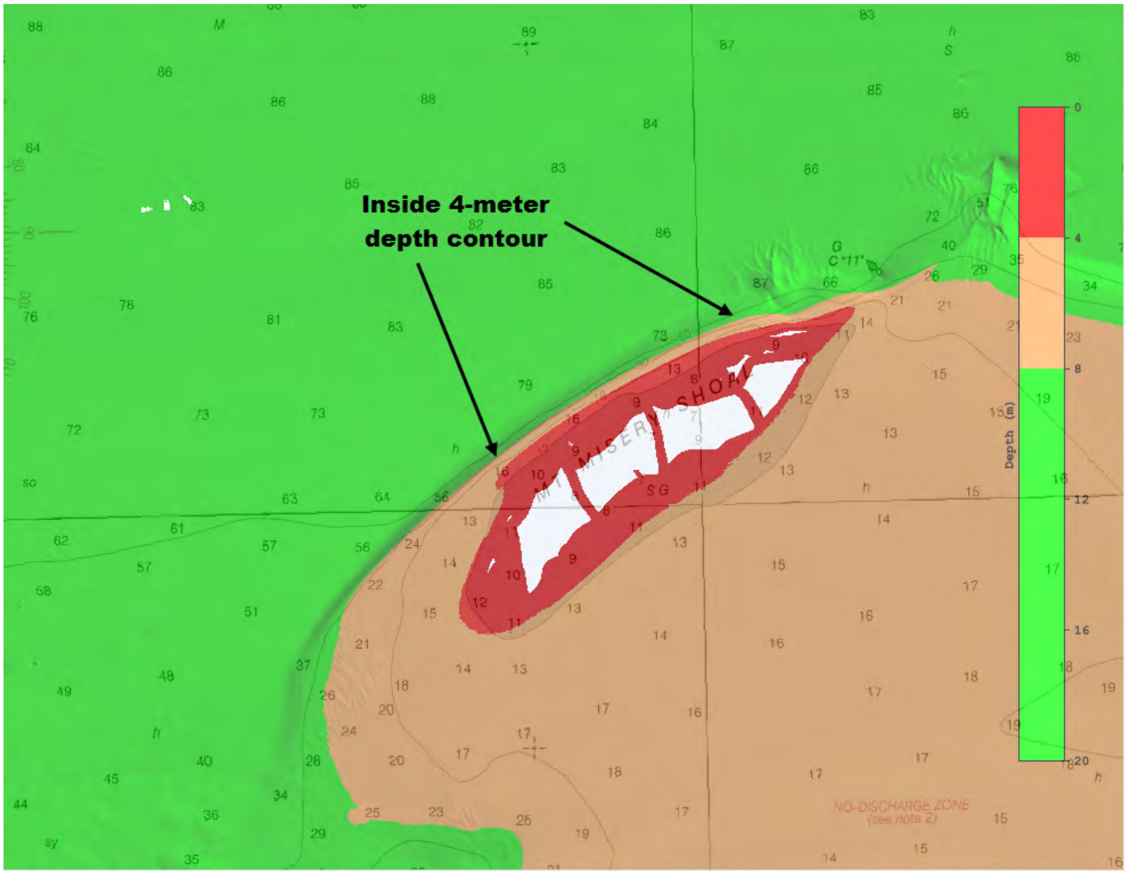


Figure 19: Multiple coverage holidays inside 4-meter depth contour of Mt Misery Shoal.

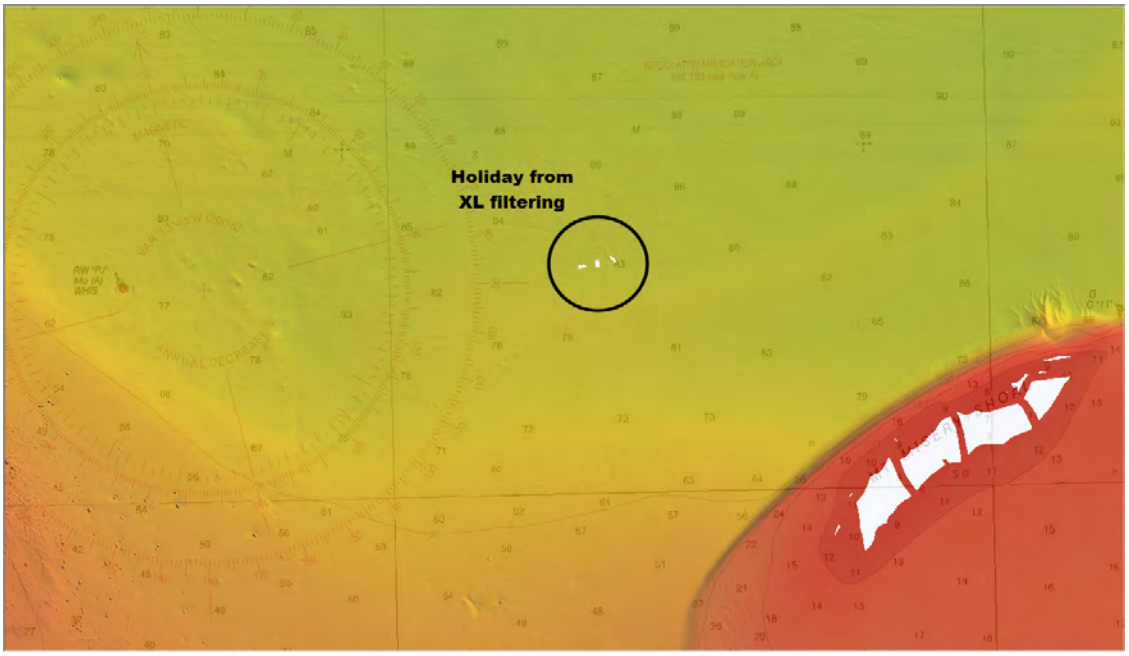


Figure 20: Coverage holiday left from XL filtering; E of Mo (A) buoy.

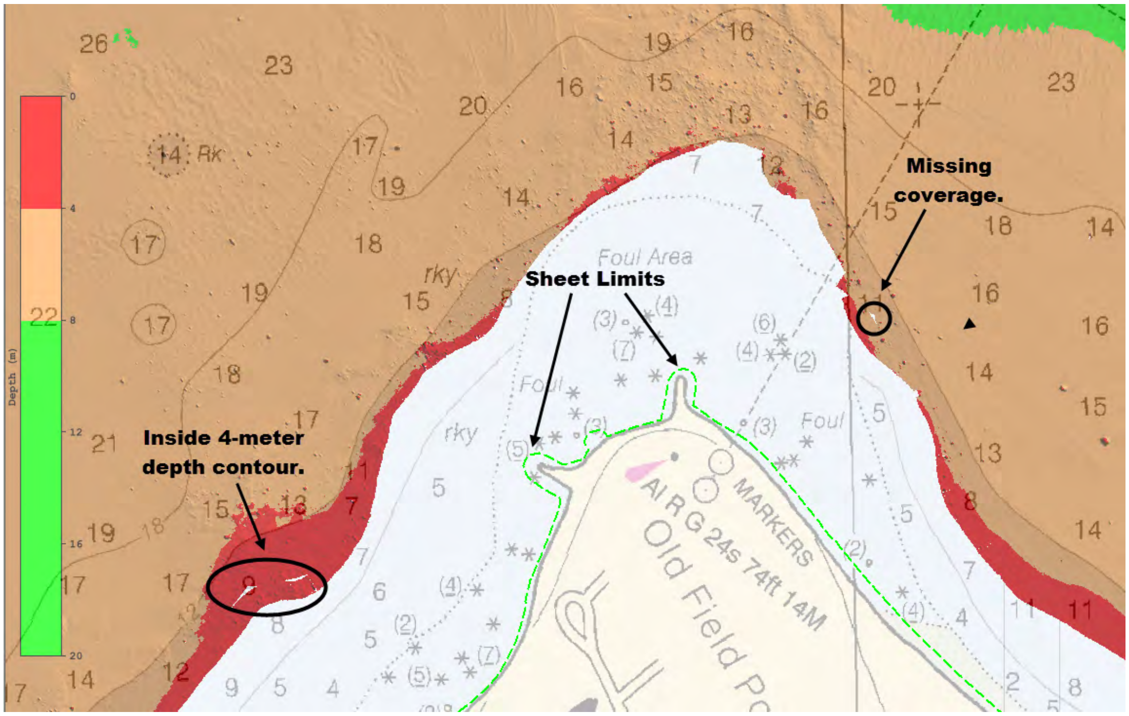


Figure 21: Coverage holidays N of Old Field Point.

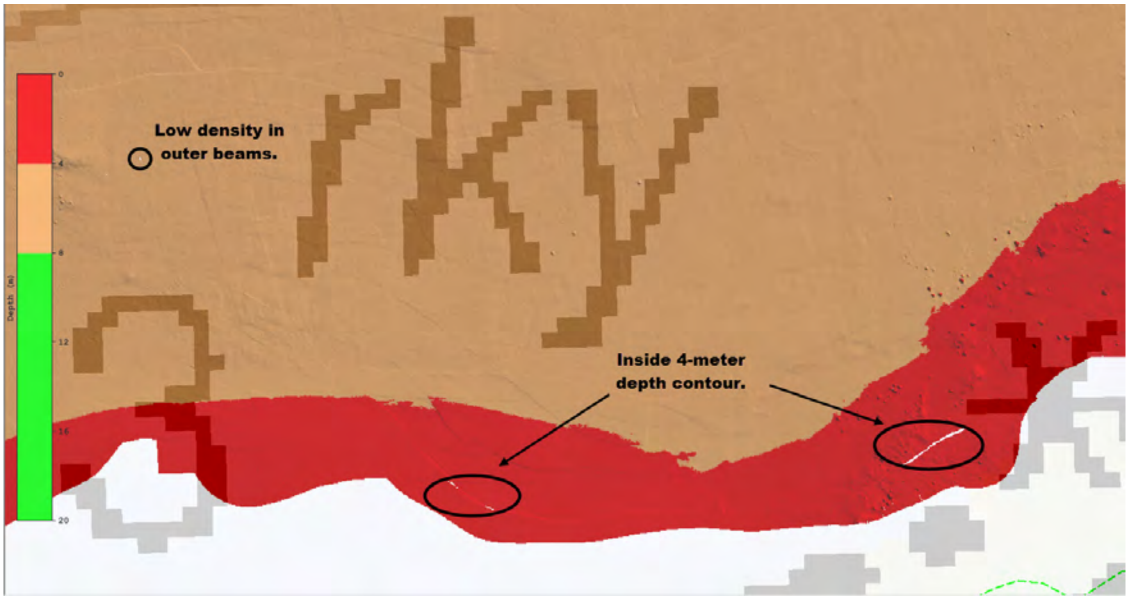


Figure 22: Coverage holidays SW of Old Field Point.

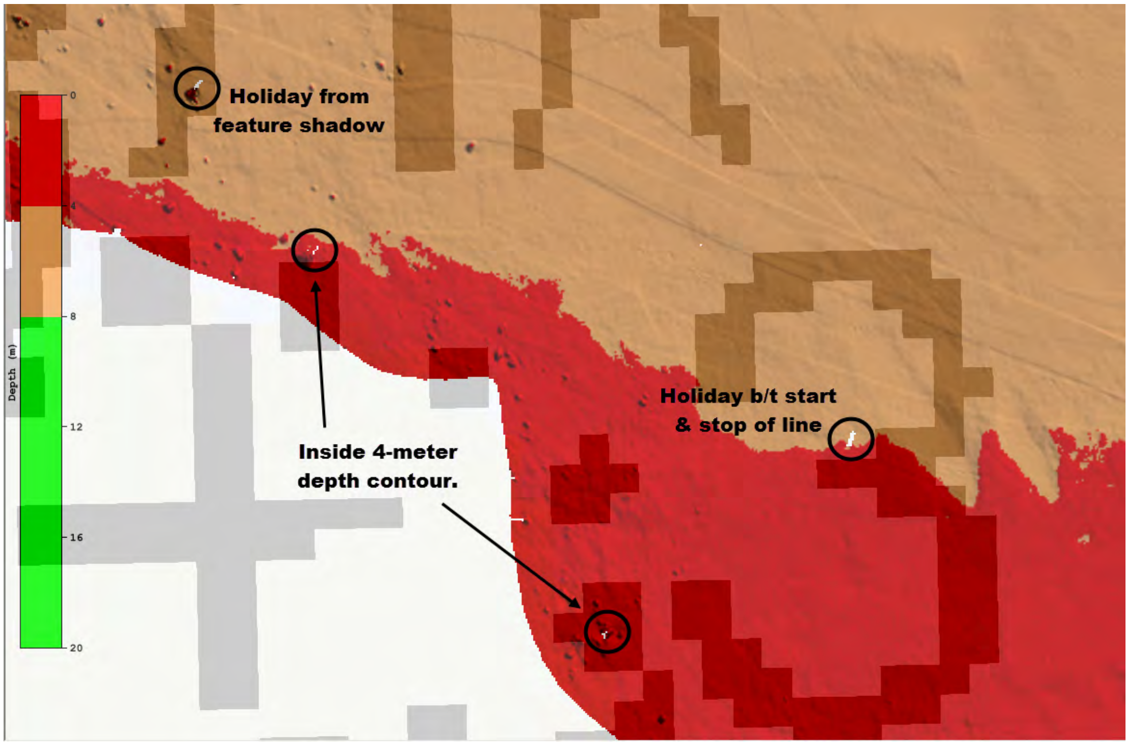


Figure 23: Coverage holidays N of Crane Neck Point.

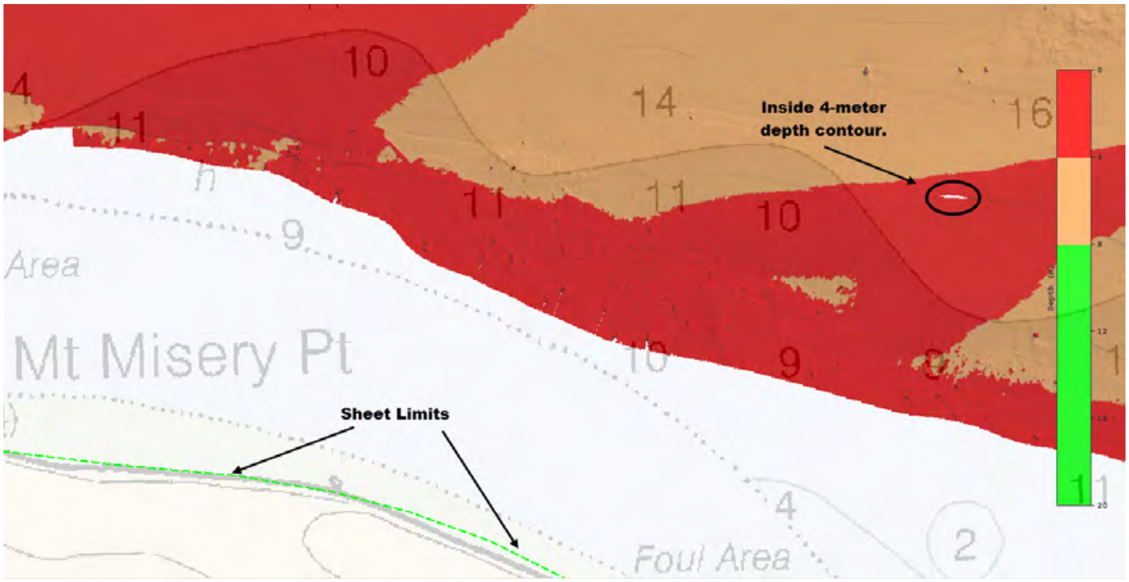


Figure 24: Coverage holiday inside 4-meter depth contour; NE of Mt Misery Point.

B.3 Echo Sounding Corrections

B.3.1 Corrections to Echo Soundings

Trueheave was not applied to four lines from vessel 3101 on DN 171 (Lines: 171_2103, 171A_1333, 171A_1704, and 171A_2059). The hydrographer investigated these lines and found that the lines were in general agreement with the surrounding data and did not exhibit any offsets due to trueheave not being applied.

B.3.2 Calibrations

All sounding systems were calibrated as detailed in the DAPR.

B.4 Backscatter

Backscatter was logged as a s7k file and submitted to the IOCM processing center and/or directly to NGDC, and is not included with the data submitted to the Branch.

B.5 Data Processing

B.5.1 Software Updates

There were no software configuration changes after the DAPR was submitted.

The following Feature Object Catalog was used: NOAAProfileField Version 5.3.2

B.5.2 Surfaces

The following surfaces and/or BAGs were submitted to the Processing Branch:

Surface Name	Surface Type	Resolution	Depth Range	Surface Parameter	Purpose
H12416_MB_50cm_MLLW	CUBE	0.5 meters	0.85 meters - 125.47 meters	NOAA_0.5m	Object Detection
H12416_MB_50cm_MLLW_Final	CUBE	0.5 meters	0 meters - 20 meters	NOAA_0.5m	MBES TracklineSBES Set Line Spacing
H12416_MB_2m_MLLW	CUBE	2 meters	0.85 meters - 54.01 meters	NOAA_2m	Complete MBES
H12416_MB_2m_MLLW_Final	CUBE	2 meters	18 meters - 40 meters	NOAA_2m	Complete MBES
H12416_MB_4m_MLLW	CUBE	4 meters	0.89 meters - 54 meters	NOAA_4m	Complete MBES
H12416_MB_4m_MLLW_Final	CUBE	4 meters	36 meters - 54 meters	NOAA_4m	Complete MBES

Table 9: Submitted Surfaces

The NOAA CUBE parameters mandated in HSSD were used for the creation of all CUBE BASE surfaces in Survey H12416. The surfaces have been reviewed where noisy data, or 'fliers', are incorporated into the gridded solution causing the surface to be shoaler or deeper than the true seafloor. Where these spurious soundings cause the gridded surface to be shoaler or deeper than the reliably measured seabed by greater than the maximum allowable vertical uncertainty at that depth, the noisy data have been rejected and the surface recomputed.

B.5.3 Data Logs

Data acquisition and processing notes are included in the acquisition and processing logs. All data logs are submitted digitally in the Separates I folder.

C. Vertical and Horizontal Control

No HVCR was submitted for H12416 per Section 5.1.2.3 of the NOAA Field Procedures Manual (ed 2012).

C.1 Vertical Control

The vertical datum for this project is Mean Lower Low Water.

Standard Vertical Control Methods Used:

TCARI

The following National Water Level Observation Network (NWLON) stations served as datum control for this survey:

Station Name	Station ID
Bridgeport, CT	8467150
New Haven, CT	8465705
Kings Point, NY	8516945

Table 10: NWLON Tide Stations

File Name	Status
8465705.tid	Final Approved
8467150.tid	Final Approved
8516945.tid	Final Approved

Table 11: Water Level Files (.tid)

File Name	Status
B340TJ2012_Rev.tc	Final

Table 12: Tide Correctors (.zdf or .tc)

A request for final approved tides was sent to N/OPS1 on 07/01/2012. The final tide note was received on 08/10/2012.

TACARI tides were applied to H12416 for initial data analysis. Data for H12416 was reduced to MLLW via VDatum.

Non-Standard Vertical Control Methods Used:

VDatum

Ellipsoid to Chart Datum Separation File:

2012_B340_VDatum_Ellip_MLLW.txt

Per the Project Instructions Appendix I, a VDatum ERS test and evaluation was performed and provided to HSD. VDatum was approved by HSD as the vertical datum reducer to MLLW for survey H12416 on 8/3/2012. Memos have been provided in Appendix I of this report.

C.2 Horizontal Control

The horizontal datum for this project is North American Datum of 1983 (NAD83).

The projection used for this project is 18N.

The following PPK methods were used for horizontal control:

Smart Base

The following CORS Stations were used for horizontal control:

HVCR Site ID	Base Station ID
CTDA	CTDA
MOR6	MOR6
NYCI	NYCI
NYQN	NYQN
NYRH	NYRH
ZNYI	ZNYI

Table 13: CORS Base Stations

The following DGPS Stations were used for horizontal control:

DGPS Stations
804 Sandy Hook, NJ 286 kHZ
803 Moriches, NY 293 kHz
772 Acushnet, MA 306 kHz

Table 14: USCG DGPS Stations

D. Results and Recommendations

D.1 Chart Comparison

Per Section 4.5 of the Field Procedures Manual (ed 2012), a chart comparison was performed of the largest scale ENC's and raster charts that cover the project area. Survey scale sounding selection and contours made from the combined surface were utilized in CARIS BASE Editor to perform this task.

D.1.1 Raster Charts

The following are the largest scale raster charts, which cover the survey area:

Chart	Scale	Edition	Edition Date	LNM Date	NM Date
12354	1:80000	44	05/2012	06/26/2012	07/30/2012
12364	1:40000	39	09/2012	06/18/2013	06/29/2013
12364	1:10000	39	09/2012	06/18/2013	06/29/2013
12362	1:10000	17	02/2005	06/26/2012	06/30/2012

Table 15: Largest Scale Raster Charts

12354

Soundings from survey H12416 generally agreed within 3 feet of charted depths on chart 12354. Descriptions of specific feature investigation and shoreline data are included in the Final Feature File submitted with this survey.

<u>12364</u>

Soundings from survey H12416 generally agreed within 3 feet of charted depths on chart 12364. Descriptions of specific feature investigation and shoreline data are included in the Final Feature File submitted with this survey.

<u>12364</u>

Soundings from survey H12416 generally agreed within 3 feet of charted depths on small-craft chart 12364, page H. Notable exceptions to this general agreement are listed and shown in the figures below. Descriptions of specific feature investigation and shoreline data are included in the Final Feature File submitted with this survey.

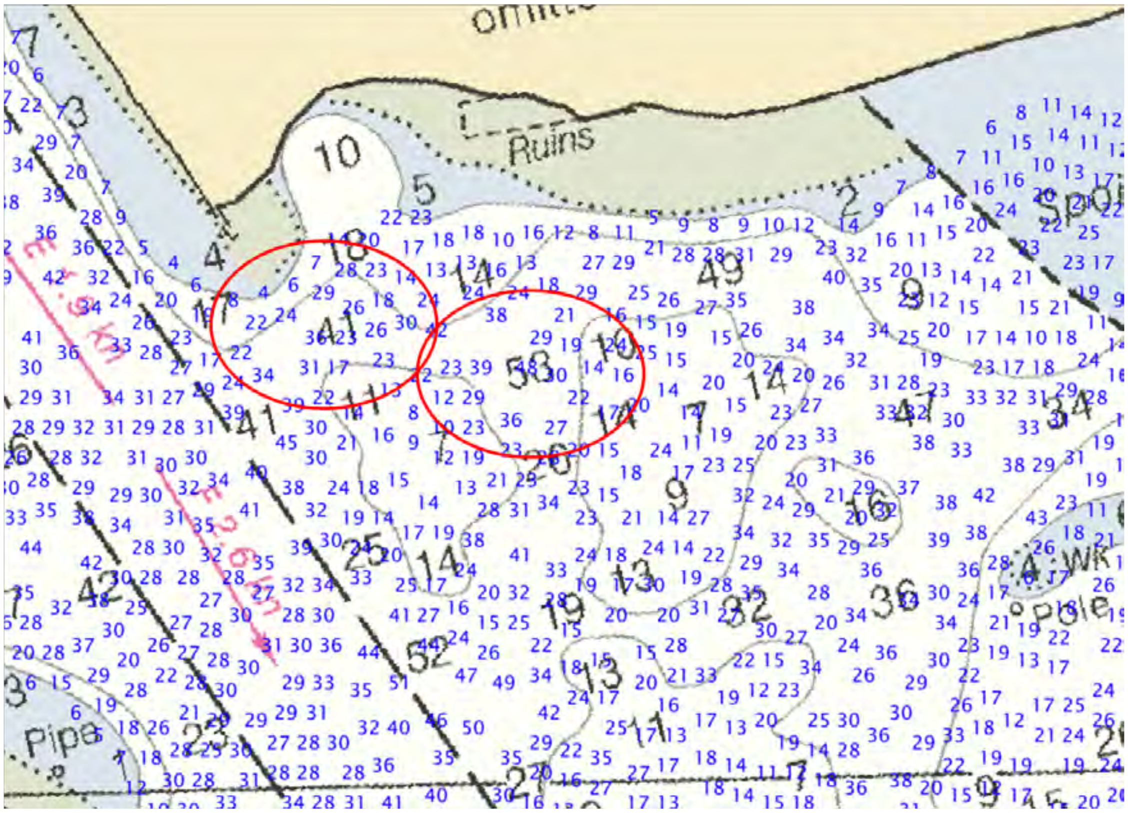


Figure 25: Survey soundings significantly shoaler in NE Port Jefferson.

<u>12362</u>

Soundings from survey H12416 generally agreed within 3 feet of charted depths on Chart 12362. Descriptions of specific feature investigation and shoreline data are included in the Final Feature File submitted with this survey.

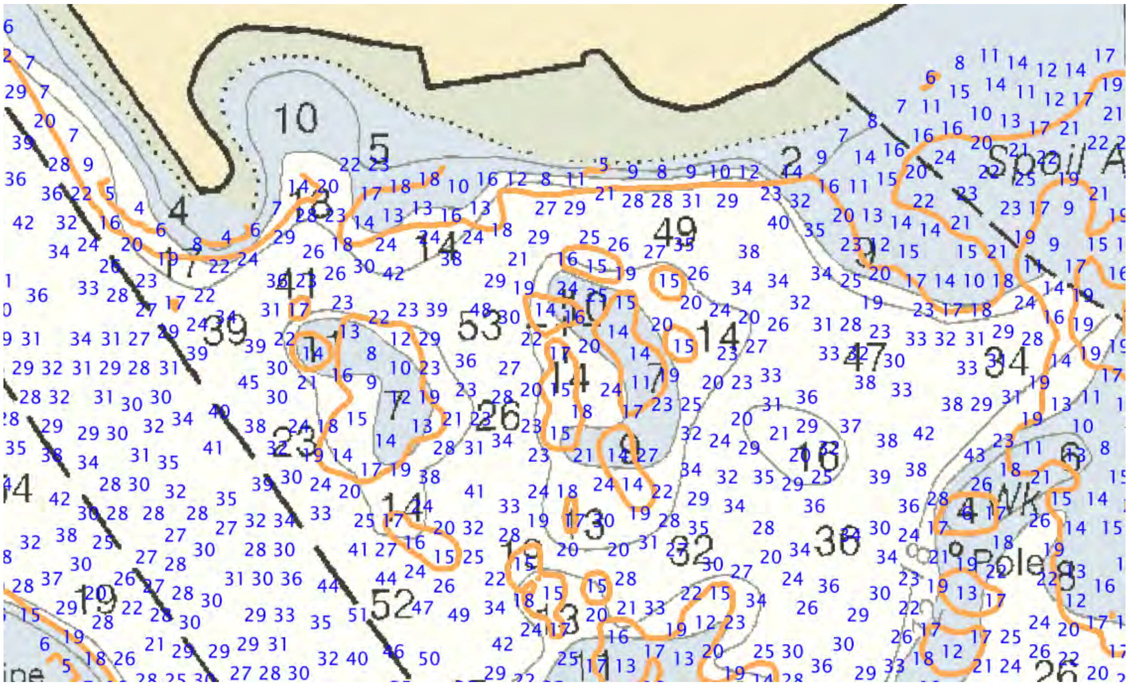


Figure 26: Multiple discrepancies were found between charted and survey data in the NE section of Port Jefferson.

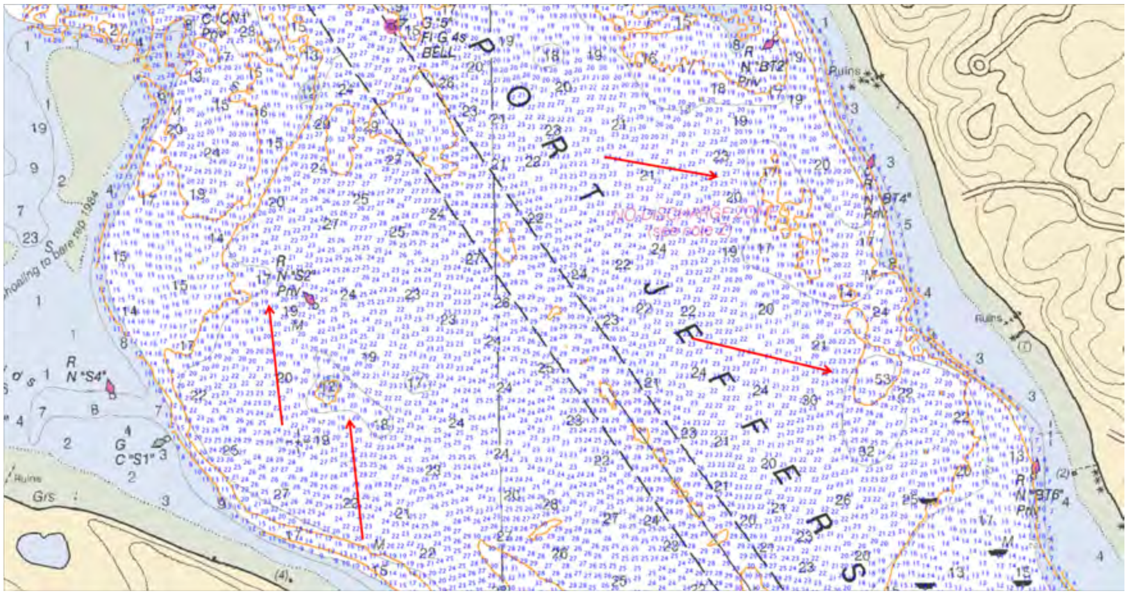


Figure 27: Shifting of contours within Port Jefferson.

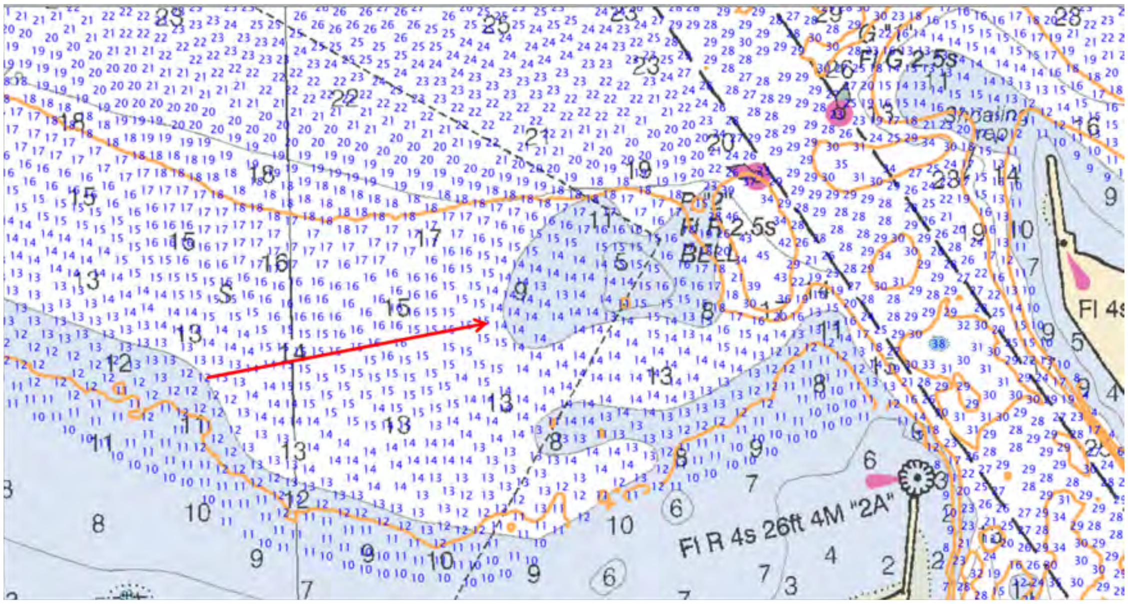


Figure 28: Shoal at the mouth of the entrance to Jefferson Harbor was disproved by survey data.

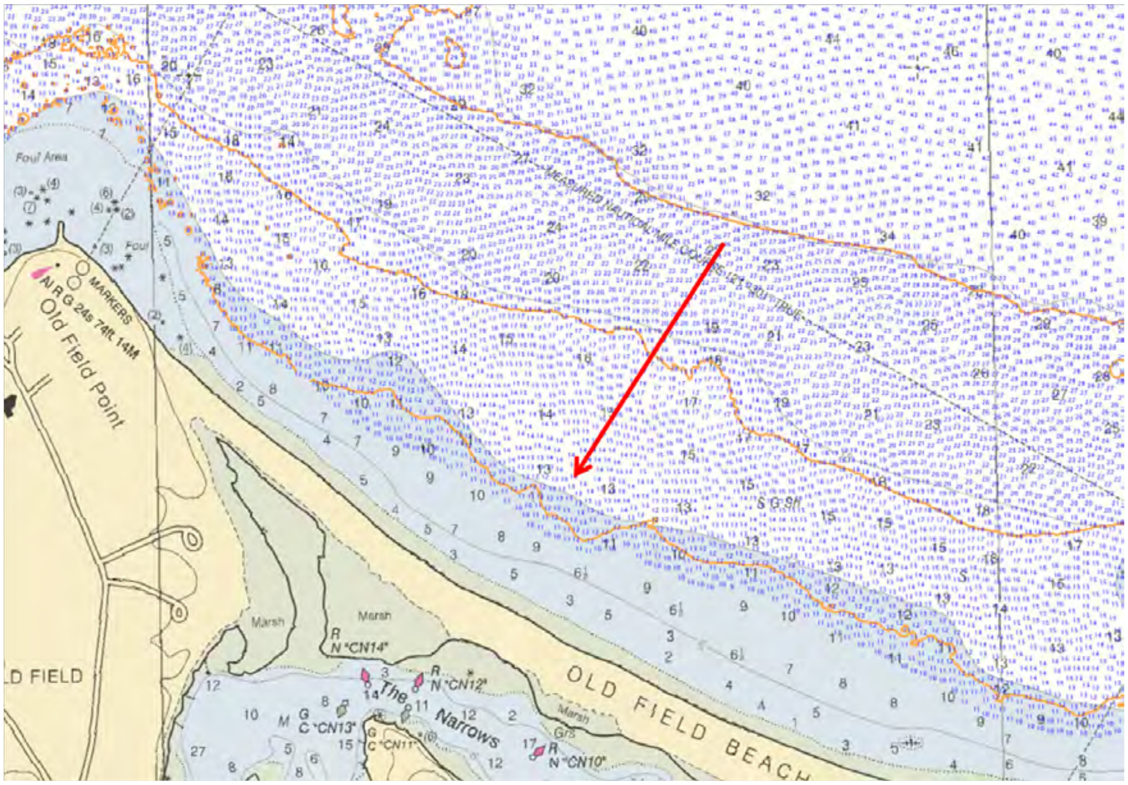


Figure 29: The 12 foot contour has shifted shoreward along Old Field Beach.

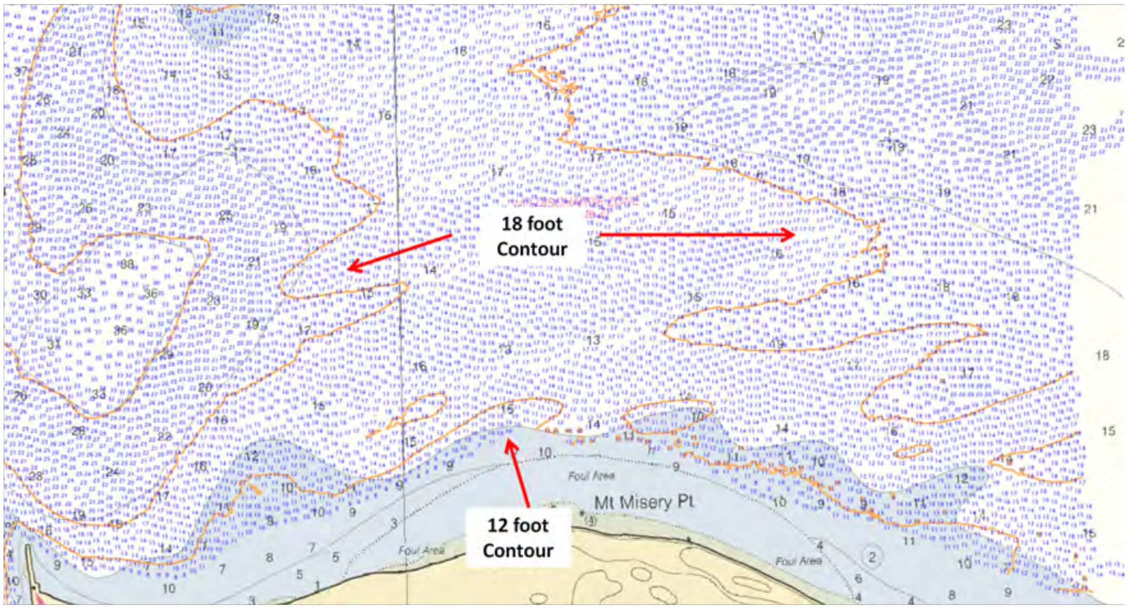


Figure 30: 18 and 12 foot contours have shifted along Mt Misery Pt.

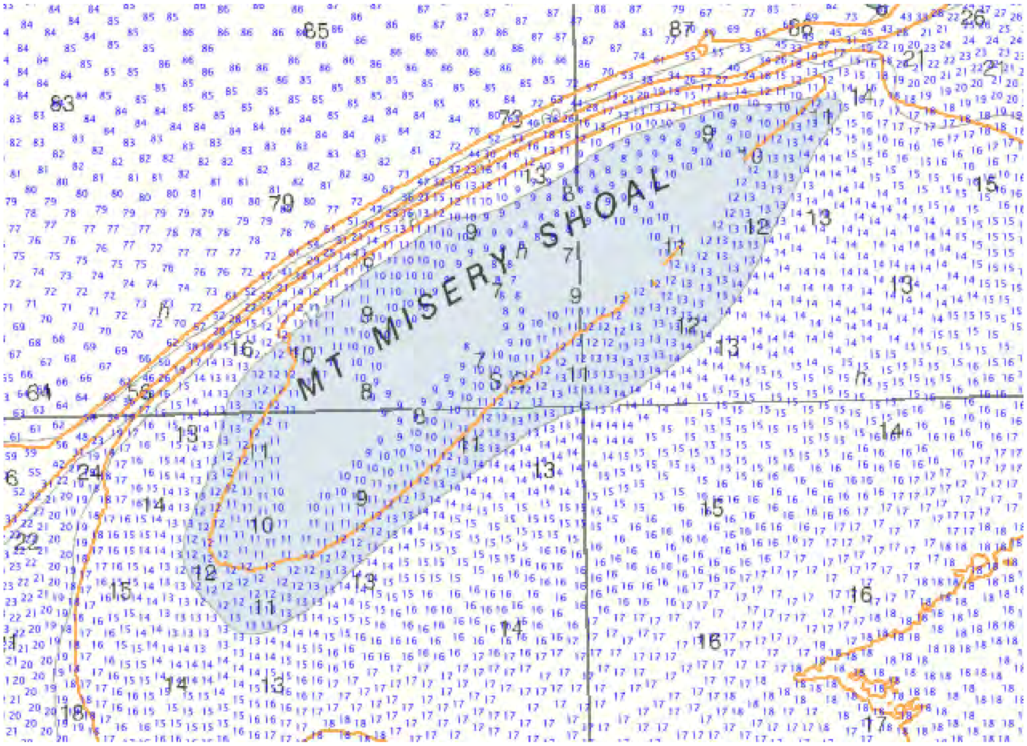


Figure 31: Mt Misery Shoal has shifted to the NW by 80 meters.

D.1.2 Electronic Navigational Charts

The following are the largest scale ENCs, which cover the survey area:

ENC	Scale	Edition	Update Application Date	Issue Date	Preliminary?
US4NY1GM	1:80000	24	12/06/2012	04/12/2013	NO
US5NY17M	1:10000	9	05/22/2012	03/11/2012	NO
US5CN10M	1:40000	4	07/24/2013	05/14/2013	NO

Table 16: Largest Scale ENCs

US4NY1GM

ENC US4NY1GM depths match RNC 12354; therefore, all RNC comparisons stated in D.1.1 apply to US4NY1GM.

US5NY17M

ENC US5NY17M depths match RNC 12362; therefore, all RNC comparisons stated in D.1.1 apply to US5NY17M.

US5CN10M

ENC US5CN10M depths match RNC 12364; therefore, all RNC comparisons stated in D.1.1 apply to US5CN10M.

D.1.3 AWOIS Items

2 AWOIS items were assigned for verification and 2 AWOIS items were provided as "Information Only". All AWOIS items were addressed in the Final Feature File.

D.1.4 Maritime Boundary Points

No Maritime Boundary Points were assigned for this survey.

D.1.5 Charted Features

No charted PA, ED, PD or Rep were found within the survey area of H12416. It was observed during survey operations that there are numerous private mooring buoys found on the west side of Port Jefferson. It is recommended to retain annotation on the chart. The annotation was not present in the Composite Source File, therefore was not added to the Final Feature File for this survey.

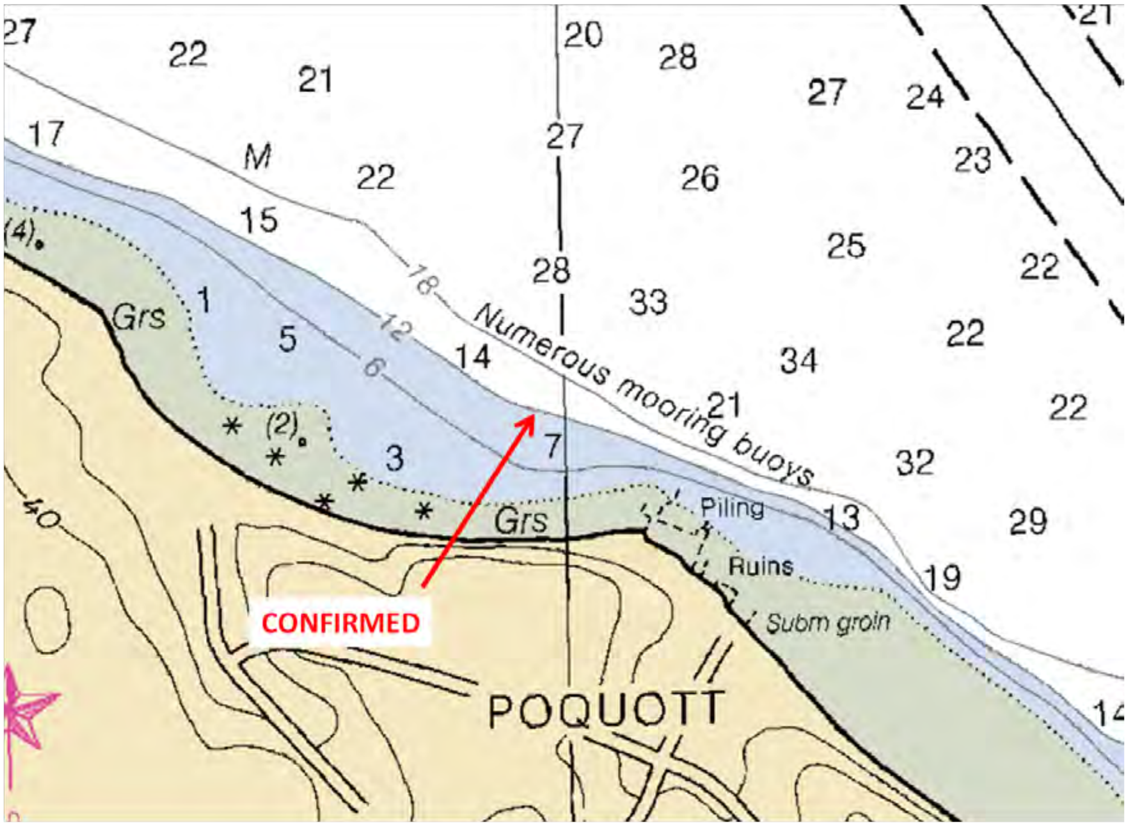


Figure 32: Annotation on chart 12362.

D.1.6 Uncharted Features

Survey H12416 contains 12 new wrecks, 19 new underwater rocks, 21 new obstructions and 3 new mooring buoys. Descriptions of specific feature investigation and shoreline data are included in the Final Feature File submitted with this survey.

D.1.7 Dangers to Navigation

The following DTON reports were submitted to the processing branch:

DTON Report Name	Date Submitted
H12416_DTON1	2012-06-22
H12416_DTON2	2012-09-11

Table 17: DTON Reports

A total number of two DTON reports were submitted to the Marine Charting Branch for survey H12416. For further information, please refer to Appendix II of this report.

D.1.8 Shoal and Hazardous Features

Charted "Mt Misery Shoal" was confirmed with multibeam data. Full multibeam coverage was not obtained over the shoal due to safety.

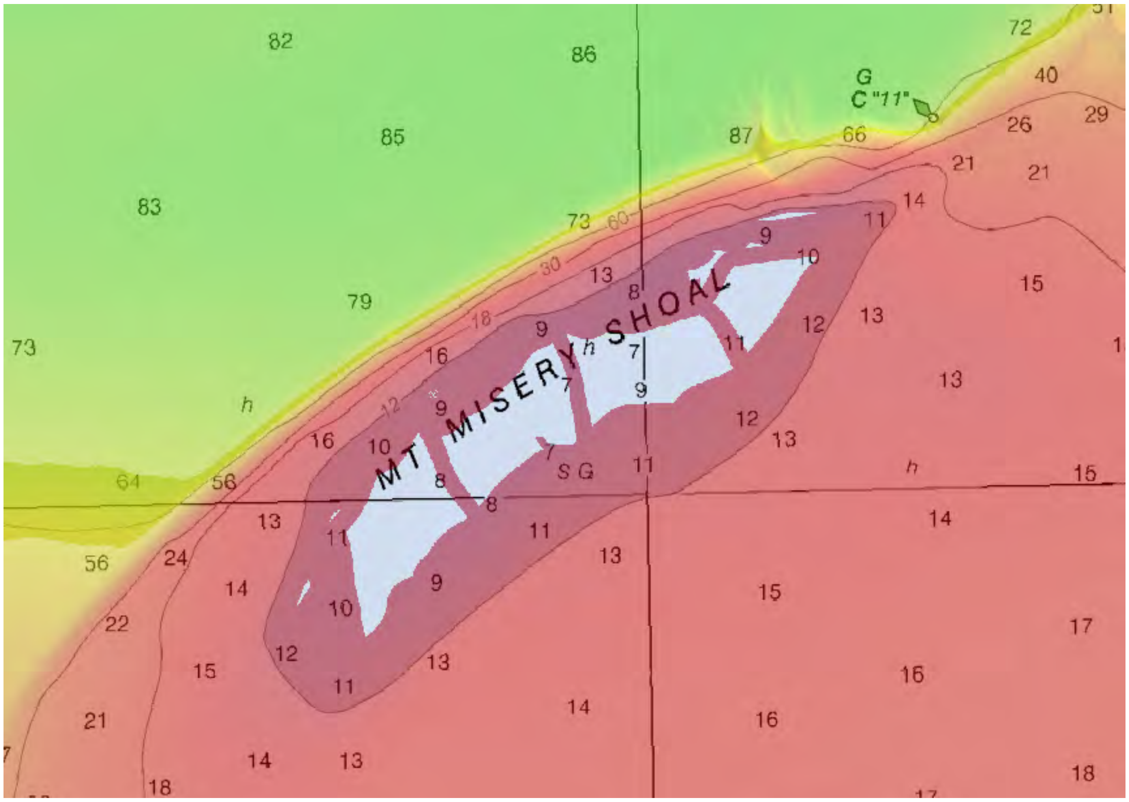


Figure 33: Charted Mt Misery Shoal with multibeam coverage.

D.1.9 Channels

According to the coast pilot, a Federal project provides for a channel 26 feet deep from Long Island Sound to the south end of Port Jefferson Harbor. A 24 foot sounding was located in the channel. The location of this discrepancy is 300 meters southwest of the northeast breakwater.

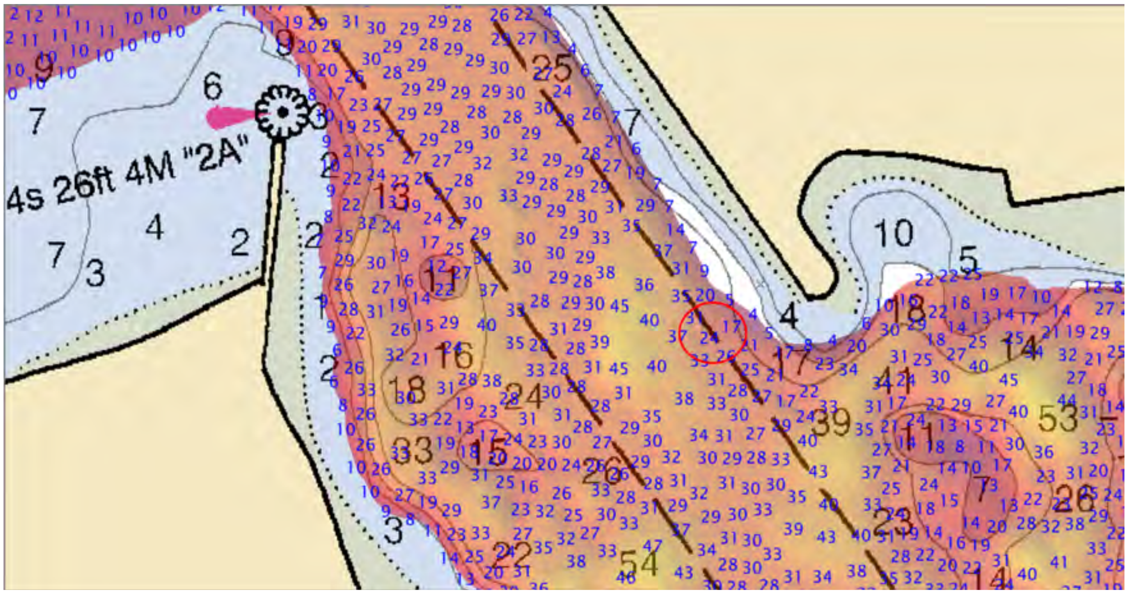


Figure 34: 24ft sounding found within the USCG maintained channel.

D.1.10 Bottom Samples

21 bottom samples were collected were collected for H12416.

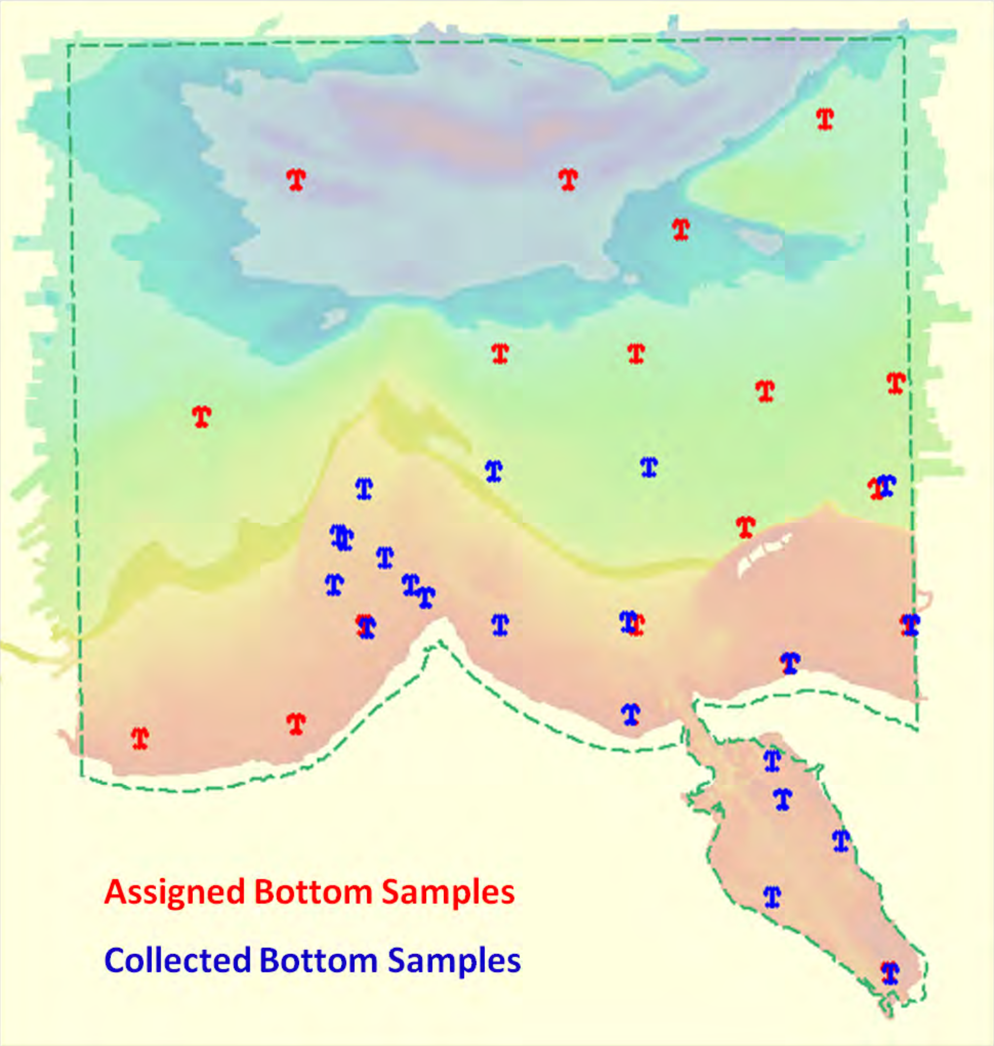


Figure 35: Locations of bottom samples for survey H12416.

D.2 Additional Results

D.2.1 Shoreline

Limited shoreline verification was accomplished using the composite source file provided with the Project Instructions. Of the 130 features assigned to H12416, 85 of the features were in areas too shallow to be safely developed. These features were not addressed. Descriptions of specific feature investigation and shoreline data are included in the Final Feature File submitted with this survey.

21 charted mooring buoys were identified for investigation. During feature investigation, it was found that these charted mooring buoys were private buoys of a seasonal nature. With guidance of the AHB's Hydrographic Team Lead, Gene Parker, it was determined that a buoy area would be used to outline the extents of the mooring field. It is recommended that the chart be updated with this area with a notation indicating “seasonal mooring buoys.” Correspondence has been provided on this subject in Appendix II.

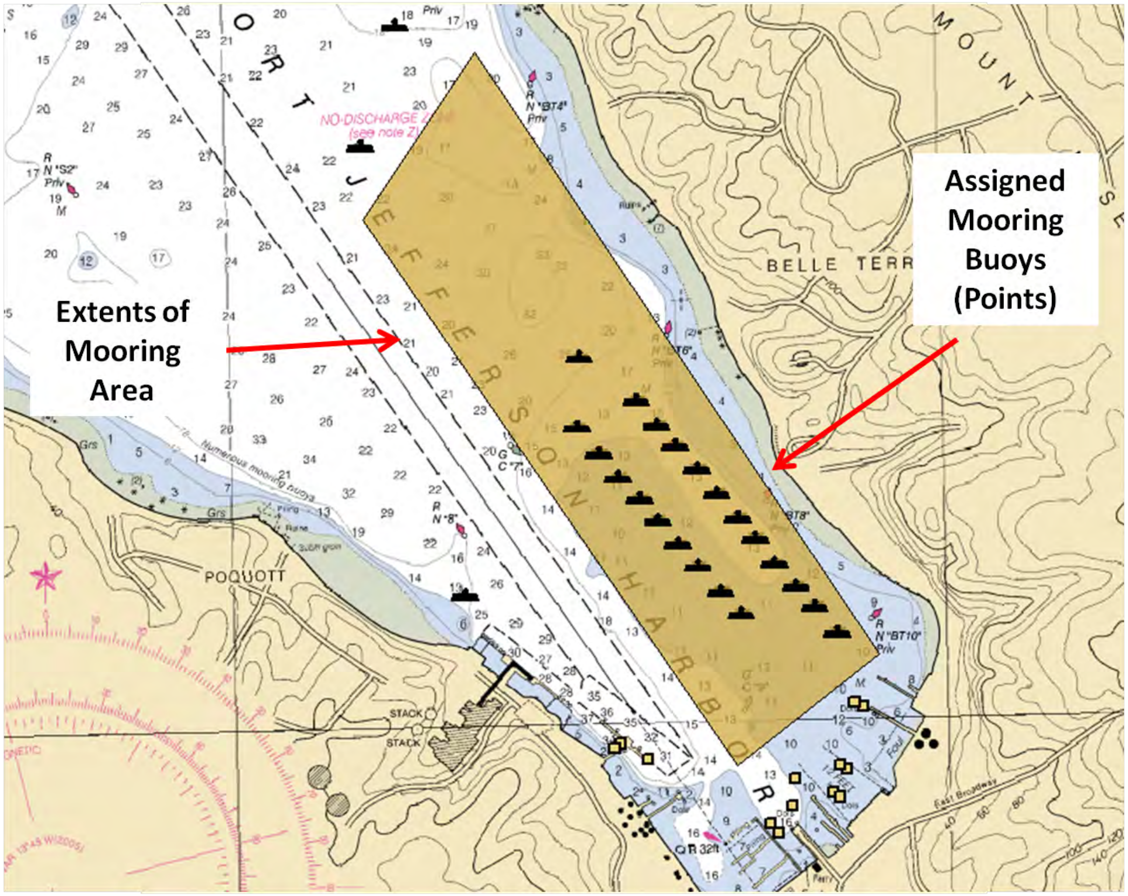


Figure 36: Extents of New Mooring Area and assigned Buoys.

D.2.2 Prior Surveys

No prior survey comparisons exist for this survey.

D.2.3 Aids to Navigation

All ATONs were found to be on station and serving their intended purpose.

D.2.4 Overhead Features

No overhead features exist for this survey.

D.2.5 Submarine Features

No submarine features exist for this survey.

D.2.6 Ferry Routes and Terminals

Ferry routes and/or terminals exist for this survey, but were not investigated.

D.2.7 Platforms

No platforms exist for this survey.

D.2.8 Significant Features

Five new sandwave areas were created during review of the high resolution mutlibeam data collected for H12416. The new sandwave areas have been provided in the final feature file for compilation purposes.

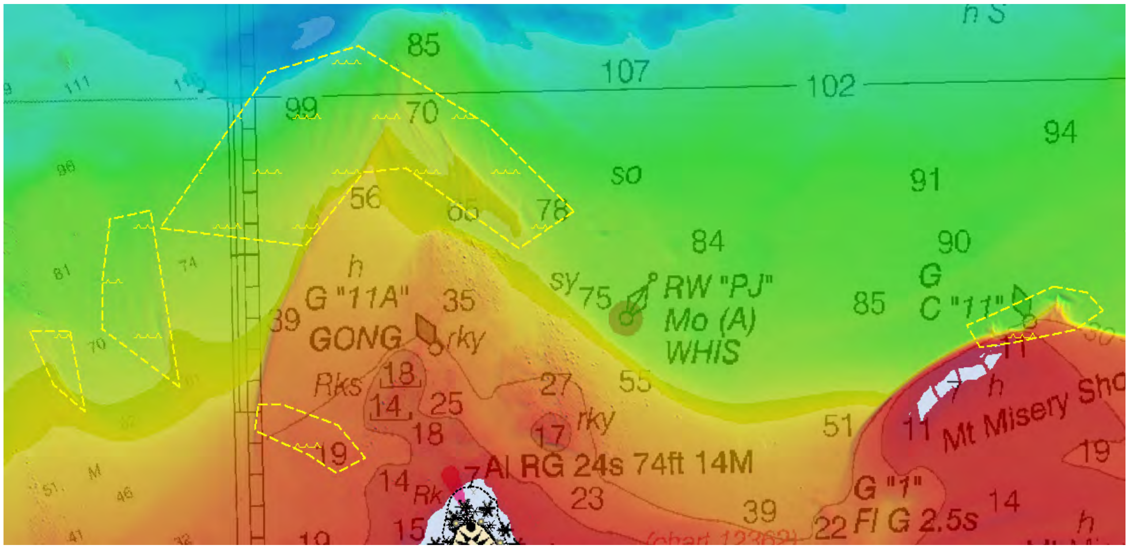


Figure 37: Sandwaves seen in the surfaces with their corresponding new features for charting purposes.

D.2.9 Construction and Dredging

No present or planned construction or dredging exist within the survey limits.

E. Approval Sheet

As Chief of Party, Field operations for this hydrographic survey were conducted under my direct supervision, with frequent personal checks of progress and adequacy. I have reviewed the attached survey data and reports.

All field sheets, this Descriptive Report, and all accompanying records and data are approved. All records are forwarded for final review and processing to the Processing Branch.

The survey data meets or exceeds requirements as set forth in the NOS Hydrographic Surveys and Specifications Deliverables Manual, Field Procedures Manual, Standing and Letter Instructions, and all HSD Technical Directives. These data are adequate to supersede charted data in their common areas. This survey is complete and no additional work is required with the exception of deficiencies noted in the Descriptive Report.

Approver Name	**Approver Title**	**Approval Date**	**Signature**
Commander Lawrence T. Krepp	Commanding Officer	08/27/2013	
Lieutenant Megan R. Guberski	Field Operations Officer	08/27/2013	

F. Table of Acronyms

Acronym	**Definition**
AHB	Atlantic Hydrographic Branch
AST	Assistant Survey Technician
ATON	Aid to Navigation
AWOIS	Automated Wreck and Obstruction Information System
BAG	Bathymetric Attributed Grid
BASE	Bathymetry Associated with Statistical Error
CO	Commanding Officer
CO-OPS	Center for Operational Products and Services
CORS	Continually Operating Reference Staiton
CTD	Conductivity Temperature Depth
CEF	Chart Evaluation File
CSF	Composite Source File
CST	Chief Survey Technician
CUBE	Combined Uncertainty and Bathymetry Estimator
DAPR	Data Acquisition and Processing Report
DGPS	Differential Global Positioning System
DP	Detached Position
DR	Descriptive Report
DTON	Danger to Navigation
ENC	Electronic Navigational Chart
ERS	Ellipsoidal Referenced Survey
ERZT	Ellipsoidally Referenced Zoned Tides
FFF	Final Feature File
FOO	Field Operations Officer
FPM	Field Procedures Manual
GAMS	GPS Azimuth Measurement Subsystem
GC	Geographic Cell
GPS	Global Positioning System
HIPS	Hydrographic Information Processing System
HSD	Hydrographic Surveys Division
HSSD	Hydrographic Survey Specifications and Deliverables

Acronym	**Definition**
HSTP	Hydrographic Systems Technology Programs
HSX	Hypack Hysweep File Format
HTD	Hydrographic Surveys Technical Directive
HVCR	Horizontal and Vertical Control Report
HVF	HIPS Vessel File
IHO	International Hydrographic Organization
IMU	Inertial Motion Unit
ITRF	International Terrestrial Reference Frame
LNM	Local Notice to Mariners
LNM	Linear Nautical Miles
MCD	Marine Chart Division
MHW	Mean High Water
MLLW	Mean Lower Low Water
NAD 83	North American Datum of 1983
NAIP	National Agriculture and Imagery Program
NALL	Navigable Area Limit Line
NM	Notice to Mariners
NMEA	National Marine Electronics Association
NOAA	National Oceanic and Atmospheric Administration
NOS	National Ocean Service
NRT	Navigation Response Team
NSD	Navigation Services Division
OCS	Office of Coast Survey
OMAO	Office of Marine and Aviation Operations (NOAA)
OPS	Operations Branch
MBES	Multibeam Echosounder
NWLON	National Water Level Observation Network
PDBS	Phase Differencing Bathymetric Sonar
PHB	Pacific Hydrographic Branch
POS/MV	Position and Orientation System for Marine Vessels
PPK	Post Processed Kinematic
PPP	Precise Point Positioning
PPS	Pulse per second

Acronym	**Definition**
PRF	Project Reference File
PS	Physical Scientist
PST	Physical Science Technician
RNC	Raster Navigational Chart
RTK	Real Time Kinematic
SBES	Singlebeam Echosounder
SBET	Smooth Best Estimate and Trajectory
SNM	Square Nautical Miles
SSS	Side Scan Sonar
ST	Survey Technician
SVP	Sound Velocity Profiler
TCARI	Tidal Constituent And Residual Interpolation
TPU	Total Porpagated Error
TPU	Topside Processing Unit
USACE	United States Army Corps of Engineers
USCG	United Stated Coast Guard
UTM	Universal Transverse Mercator
XO	Executive Officer
ZDA	Global Positiong System timing message
ZDF	Zone Definition File

Appendix 3: Sediment Texture Cruise Details

LDEO Cruise details LIS1303 – sediment sampling

Field work was carried out in June 2013 together with sediment coring. For the grab sampling we used the *RV Seawolf* (Stony Brook University) for most areas and the *RV Pritchard* (Stony Brook University) for shallow sites along the southern shore.

Dates of sampling: 5. June. 2013 to 13. June 2013

Start and end in Port Jefferson, NY every day

Vessels:

- RV Seawolf (Stony Brook University)
- RV Pritchard (Stony Brook University)

In total we collected 196 grab samples (Tab. A3-1) and 46 sediment cores (Tab. A3-2). Figure A3-1 shows the location of the sediment grab sites collected by USGS and LDEO/Queens. Figure A3-2 shows the location of the sediment core sites.

Table A3.1: Table A3-1: Field data details of the sediment grab collection.

Survey date	Field days	Vessel	Grab samples
June 5-12 2013	6	Seawolf	167
June 13 2013	1	Pritchard	29
Total	7		**196**

Table A3.2: Field data details of the sediment core collection.

Survey date	Field days	Vessel	Core samples
June 5-12 2013	6	Seawolf	46

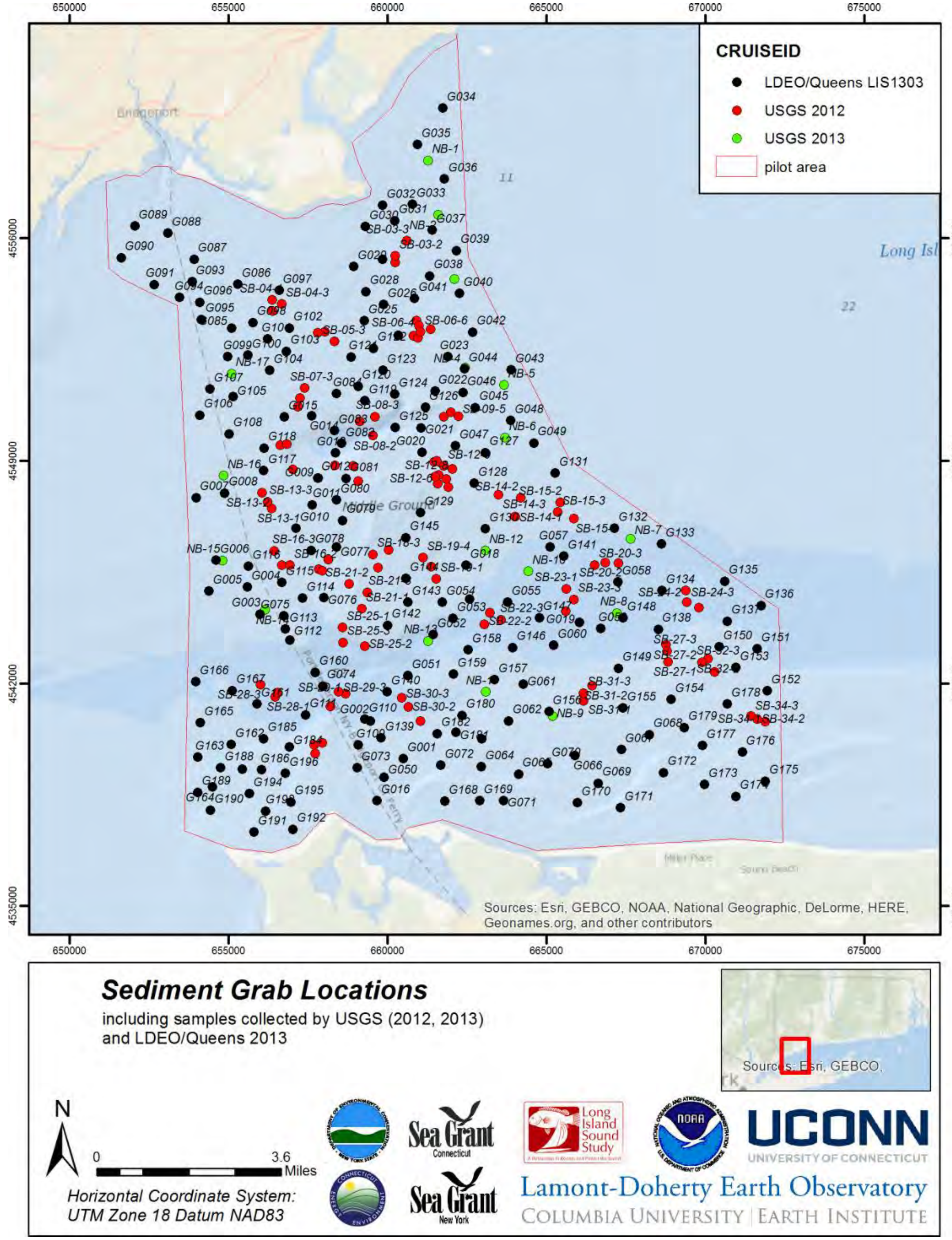


Figure A3-1: Location of sediment grab samples collected by the USGS surveys in 2012 and 2013 (red and green respectively) and in June 2013 by the LDEO/Queens College group (black).

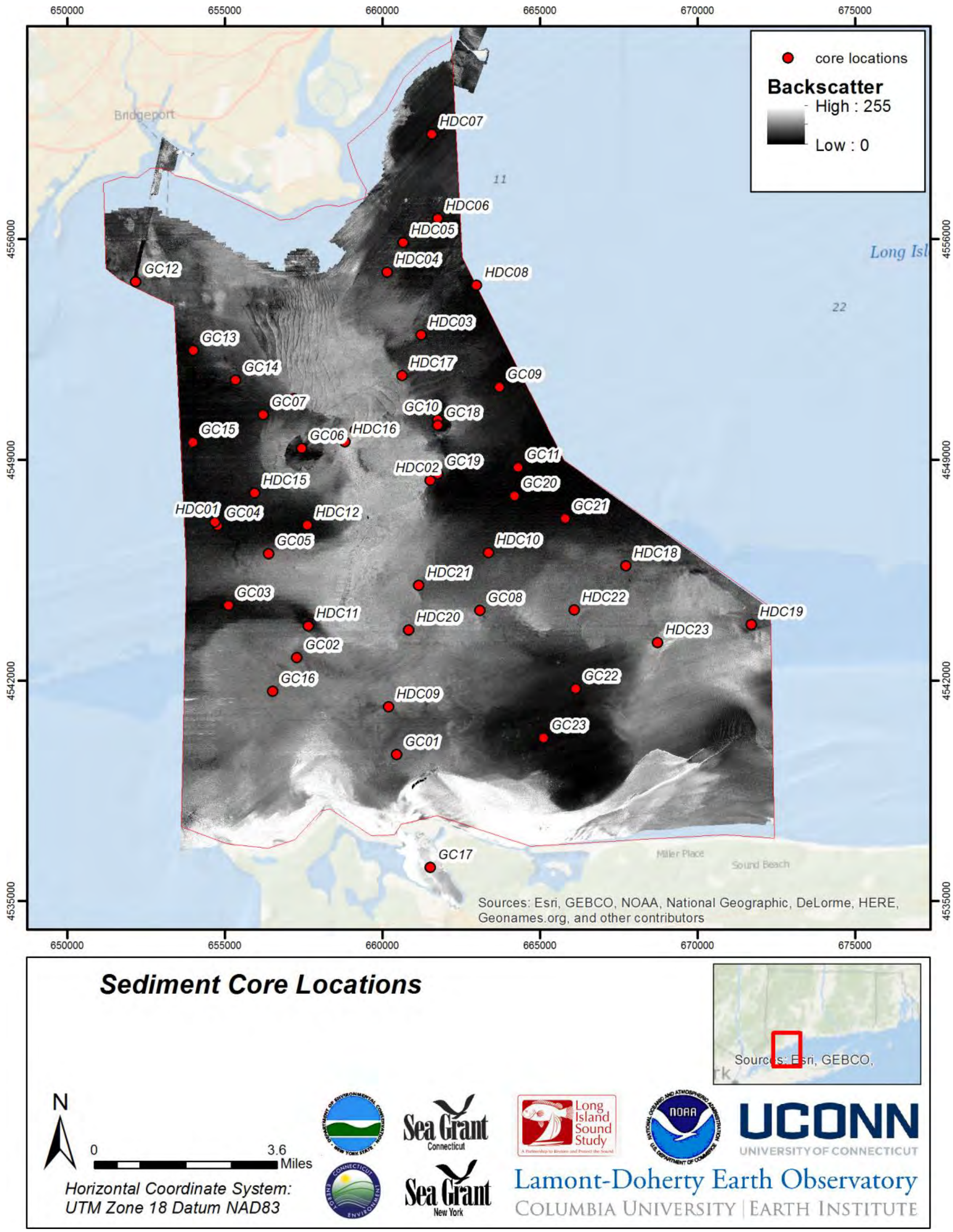


Figure A3-2: Location of the sediment cores over the backscatter mosaic. GCxx are gravity cores and HDCxx are cores taken with the hydraulic-damped corer

The sediment grabs were collected using a modified van Veen grab. Upon recovery of the grab samples, the following procedure was followed. A surface photo was taken and a brief description about the sediment texture and composition was noted in a table.

For the sediment core collection we used a small gravity corer (from LDEO) and a hydraulically damped gravity corer from USGS.

More details about the sampling procedures and sample handling are described in the main report (sections 3 and 4).

LISMARC Sediment Texture Acquisition Cruise Details
2012 Sediment Texture Sampling Log
2013 Sediment Texture Sampling Log

2012 Sediment Texture Sampling Log

LABNO	STATIONID	PROJECT	CRUISEID	AREA	LATITUDE
AZ909	SB-03-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.132533
AZ910	SB-03-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.134400
AZ911	SB-03-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.138633
AZ912	SB-04-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.122717
AZ913	SB-04-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.119633
AZ914	SB-04-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.121550
AZ915	SB-05-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.113367
AZ916	SB-05-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.110533
AZ917	SB-05-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.113067
AZ918	SB-06-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.111750
AZ919	SB-06-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.116017
AZ920	SB-06-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.111133
AZ921	SB-06-4	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.114533
AZ922	SB-06-5	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.113417
AZ923	SB-06-6	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.112800
AZ924	SB-07-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.094733
AZ925	SB-07-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.092283
AZ926	SB-07-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.097583
AZ927	SB-08-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.087733
AZ928	SB-08-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.083650
AZ929	SB-08-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.089050
AZ930	SB-09-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.089783
AZ931	SB-09-4	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.088583
AZ932	SB-09-5	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.088667
AZ933	SB-10-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.081483
AZ934	SB-10-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.081750
AZ935	SB-10-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.074550
AZ936	SB-11-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.070883
AZ937	SB-11-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.075533
AZ938	SB-11-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.075283
AZ939	SB-12-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.070867
AZ940	SB-12-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.072150
AZ941	SB-12-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.075833
AZ942	SB-12-4	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.073750
AZ943	SB-12-5	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.068667
AZ944	SB-12-6	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.069717
AZ945	SB-12-7	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.076200
AZ946	SB-12-8	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.071683
AZ947	SB-12-9	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.074650
AZ948	SB-13-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.063717
AZ949	SB-13-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.068233
AZ950	SB-13-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.065633
AZ951	SB-14-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.059933
AZ952	SB-14-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.065133
AZ953	SB-14-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.066167
AZ954	SB-15-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.058983
AZ955	SB-15-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.063600

AZ956	SB-15-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.060883
AZ957	SB-16-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.047567
AZ958	SB-16-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.047483
AZ959	SB-16-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.051667
AZ960	SB-17-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.046167
AZ961	SB-17-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.048833
AZ962	SB-17-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.045800
AZ963	SB-18-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.046317
AZ964	SB-18-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.051167
AZ965	SB-18-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.050083
AZ966	SB-19-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.042700
AZ967	SB-19-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.046267
AZ968	SB-19-4	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.048867
AZ969	SB-20-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.046017
AZ970	SB-20-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.046300
AZ971	SB-20-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.045700
AZ972	SB-21-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.034783
AZ973	SB-21-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.041883
AZ974	SB-21-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.039383
AZ975	SB-22-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.032800
AZ976	SB-22-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.029617
AZ977	SB-22-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.030800
AZ978	SB-23-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.039117
AZ979	SB-23-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.032717
AZ980	SB-23-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.036050
AZ981	SB-24-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.032933
AZ982	SB-24-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.037833
AZ983	SB-24-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.034617
AZ984	SB-25-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.029533
AZ985	SB-25-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.024183
AZ986	SB-25-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.025350
AZ987	SB-27-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.017817
AZ988	SB-27-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.022633
AZ989	SB-27-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.020850
AZ990	SB-28-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.010417
AZ991	SB-28-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.011517
AZ992	SB-28-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.013917
AZ993	SB-29-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.010817
AZ994	SB-29-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.007367
AZ995	SB-29-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.011433
AZ996	SB-30-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.002550
AZ997	SB-30-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.006733
AZ998	SB-30-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.009267
AZ999	SB-31-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.007250
BA001	SB-31-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.011550
BA002	SB-31-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.009517
BA003	SB-32-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.014567
BA004	SB-32-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.018450

BA005	SB-32-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.017483
BA006	SB-33-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	40.994083
BA007	SB-33-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	40.996550
BA008	SB-33-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	40.997100
BA009	SB-34-1	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.000233
BA010	SB-34-2	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.001000
BA011	SB-34-3	LISMARC PILOT	2012-028-FA	LONG ISLAND SOUND	41.001967

LONGITUDE	DEPTH_M	T_DEPTH	B_DEPTH	DEVICE	MONTH	DAY	YEAR	WEIGHT
-73.090833	-9999	0	2	SEABOSS	10	10	2012	26.3556
-73.090880	-9999	0	2	SEABOSS	10	10	2012	17.5749
-73.086450	12.5	0	2	SEABOSS	10	10	2012	20.7324
-73.137300	8	0	2	SEABOSS	10	11	2012	40.5004
-73.137217	8	0	2	SEABOSS	10	11	2012	37.4820
-73.133783	-9999	0	2	SEABOSS	10	11	2012	41.7311
-73.117900	9	0	2	SEABOSS	10	11	2012	40.3924
-73.114333	11	0	2	SEABOSS	10	11	2012	167.3268
-73.120417	8	0	2	SEABOSS	10	11	2012	48.7968
-73.084717	15.7	0	2	SEABOSS	10	10	2012	15.8962
-73.083417	15.5	0	2	SEABOSS	10	10	2012	20.2423
-73.082917	16.2	0	2	SEABOSS	10	10	2012	16.4379
-73.082583	16	0	2	SEABOSS	10	10	2012	14.9856
-73.078217	16.7	0	2	SEABOSS	10	10	2012	17.7259
-73.082067	16.5	0	2	SEABOSS	10	10	2012	14.8790
-73.127583	17.6	0	2	SEABOSS	10	11	2012	23.6522
-73.128550	17	0	2	SEABOSS	10	11	2012	25.5018
-73.125817	11	0	2	SEABOSS	10	11	2012	46.4847
-73.105533	33	0	2	SEABOSS	10	15	2012	34.1207
-73.100767	28	0	2	SEABOSS	10	15	2012	138.0816
-73.099700	23	0	2	SEABOSS	10	15	2012	51.0967
-73.071250	26	0	2	SEABOSS	10	15	2012	38.1442
-73.073983	30	0	2	SEABOSS	10	15	2012	16.8784
-73.068500	-9999	0	2	SEABOSS	10	15	2012	47.3341
-73.135400	19	0	2	SEABOSS	10	11	2012	42.4755
-73.132850	11	0	2	SEABOSS	10	11	2012	55.1365
-73.130850	19	0	2	SEABOSS	10	11	2012	37.4669
-73.106583	16	0	2	SEABOSS	10	13	2012	52.9510
-73.115050	24	0	2	SEABOSS	10	13	2012	43.6014
-73.108350	15	0	2	SEABOSS	10	13	2012	160.9496
-73.073500	24	0	2	SEABOSS	10	15	2012	16.5834
-73.076317	24	0	2	SEABOSS	10	15	2012	30.4588
-73.078017	23	0	2	SEABOSS	10	15	2012	-9999
-73.071167	26	0	2	SEABOSS	10	15	2012	19.7413
-73.072817	22	0	2	SEABOSS	10	15	2012	19.7224
-73.076900	21	0	2	SEABOSS	10	15	2012	23.1059
-73.076967	21	0	2	SEABOSS	10	15	2012	-9999
-73.077633	15	0	2	SEABOSS	10	15	2012	-9999
-73.074400	24	0	2	SEABOSS	10	15	2012	48.8459
-73.139217	21	0	2	SEABOSS	10	12	2012	20.7306
-73.142617	20	0	2	SEABOSS	10	12	2012	22.6893
-73.140617	21	0	2	SEABOSS	10	12	2012	19.7520
-73.048100	31	0	2	SEABOSS	10	15	2012	15.9794
-73.045967	28	0	2	SEABOSS	10	15	2012	16.5476
-73.054167	26	0	2	SEABOSS	10	15	2012	17.0332
-73.026150	34	0	2	SEABOSS	10	17	2012	15.0834
-73.031183	31	0	2	SEABOSS	10	17	2012	14.8721

-73.032100	33	0	2	SEABOSS	10	17	2012	14.7784
-73.135750	26	0	2	SEABOSS	10	17	2012	45.6621
-73.132717	26	0	2	SEABOSS	10	17	2012	48.2443
-73.138533	-9999	0	2	SEABOSS	10	17	2012	30.8033
-73.122017	32	0	2	SEABOSS	10	13	2012	101.2948
-73.118400	27	0	2	SEABOSS	10	13	2012	41.7491
-73.120633	32	0	2	SEABOSS	10	13	2012	108.9760
-73.099900	22	0	2	SEABOSS	10	13	2012	172.6051
-73.095683	22	0	2	SEABOSS	10	13	2012	133.8884
-73.101733	22	0	2	SEABOSS	10	13	2012	168.7600
-73.078150	34	0	2	SEABOSS	10	13	2012	33.5943
-73.080033	33	0	2	SEABOSS	10	13	2012	37.0575
-73.083017	-9999	0	2	SEABOSS	10	13	2012	44.4398
-73.009917	37	0	2	SEABOSS	10	16	2012	26.9092
-73.014750	37	0	2	SEABOSS	10	16	2012	18.2120
-73.018783	37	0	2	SEABOSS	10	16	2012	29.0528
-73.106233	23	0	2	SEABOSS	10	13	2012	45.5227
-73.110683	22	0	2	SEABOSS	10	13	2012	146.6863
-73.104000	21	0	2	SEABOSS	10	13	2012	50.4779
-73.058483	38	0	2	SEABOSS	10	15	2012	35.4281
-73.060617	40	0	2	SEABOSS	10	15	2012	43.5435
-73.054317	39	0	2	SEABOSS	10	15	2012	27.0618
-73.029633	38	0	2	SEABOSS	10	16	2012	24.8118
-73.030000	37	0	2	SEABOSS	10	16	2012	28.6543
-73.026883	38	0	2	SEABOSS	10	16	2012	27.5802
-72.980200	40	0	2	SEABOSS	10	16	2012	43.6516
-72.984917	39	0	2	SEABOSS	10	16	2012	55.2776
-72.984633	-9999	0	2	SEABOSS	10	16	2012	38.4336
-73.113600	26	0	2	SEABOSS	10	12	2012	134.2492
-73.105483	40	0	2	SEABOSS	10	12	2012	183.6004
-73.113467	45	0	2	SEABOSS	10	12	2012	40.4300
-72.992150	-9999	0	2	SEABOSS	10	16	2012	112.3887
-72.992917	42	0	2	SEABOSS	10	16	2012	33.4069
-72.992417	37	0	2	SEABOSS	10	16	2012	42.1745
-73.139383	38	0	2	SEABOSS	10	12	2012	31.6411
-73.138300	38	0	2	SEABOSS	10	12	2012	35.0625
-73.144783	38	0	2	SEABOSS	10	12	2012	28.9455
-73.112983	43	0	2	SEABOSS	10	12	2012	34.4256
-73.118700	45	0	2	SEABOSS	10	12	2012	42.2866
-73.115550	42	0	2	SEABOSS	10	12	2012	36.8877
-73.085133	33	0	2	SEABOSS	10	17	2012	22.4298
-73.089700	35	0	2	SEABOSS	10	17	2012	28.7776
-73.092000	36	0	2	SEABOSS	10	17	2012	42.0045
-73.024067	28	0	2	SEABOSS	10	16	2012	12.6791
-73.020850	31	0	2	SEABOSS	10	16	2012	12.2371
-73.024033	-9999	0	2	SEABOSS	10	16	2012	15.9875
-72.974883	-9999	0	2	SEABOSS	10	14	2012	48.5249
-72.977200	29	0	2	SEABOSS	10	14	2012	54.2715

-72.979550	-9999	0	2	SEABOSS	10	14	2012	44.3938
-73.124783	-9999	0	2	SEABOSS	10	12	2012	47.5542
-73.125167	24	0	2	SEABOSS	10	12	2012	44.8022
-73.122017	19	0	2	SEABOSS	10	12	2012	44.3974
-72.956400	-9999	0	2	SEABOSS	10	14	2012	43.7368
-72.959333	14	0	2	SEABOSS	10	14	2012	41.1302
-72.961700	15	0	2	SEABOSS	10	14	2012	47.7844

ZGRAVEL	ZSAND	ZSILT	ZCLAY	SEDCLASS	MEDIAN	MEAN	STDDEV
0.12	38.48	41.64	19.76	SANDY SILT	5.88	4.71	3.55
0.06	30.77	48.95	20.22	SAND SILT CLAY	6.28	5.88	2.47
0.1	24.8	45.22	29.88	SAND SILT CLAY	6.84	6.41	2.59
0.81	95.12	2.63	1.45	SAND	2.19	2.21	1.32
0	97.59	1.55	0.86	SAND	2.32	2.32	0.93
0	98.65	0.85	0.5	SAND	1.93	2.02	0.79
2.77	96.02	0.63	0.58	SAND	0.56	0.63	1.02
46.9	50.79	1.22	1.1	GRAVELLY SEDIMENT	-0.55	-0.94	2.71
4.8	90.03	3.23	1.94	SAND	0.88	1.08	1.79
0	10.4	51.87	37.73	CLAYEY SILT	7.51	7.23	2.27
0.06	18.37	54.56	27	CLAYEY SILT	6.82	6.38	2.63
0	7.81	56.54	35.65	CLAYEY SILT	7.41	7.18	2.14
0	12.01	53.9	34.09	CLAYEY SILT	7.26	6.94	2.41
0.16	22.81	48.34	28.69	SAND SILT CLAY	6.87	6.24	2.84
0	9.74	57.91	32.35	CLAYEY SILT	7.2	7	2.22
0.63	59.35	25.24	14.78	SILTY SAND	2.79	4.21	2.95
0	40.76	36.75	22.49	SAND SILT CLAY	6.18	5.42	2.99
2.28	95.42	1.52	0.79	SAND	0.63	0.76	1.21
0.8	75.25	14.15	9.8	SAND	1.75	2.91	2.89
81.78	16.34	1.17	0.71	GRAVEL	-4.3	-3.11	2.75
10.01	87.58	1.4	1.01	GRAVELLY SEDIMENT	1.08	0.93	1.6
6.64	75.81	10.22	7.33	SAND	1.79	2.42	2.83
0	13.44	49.67	36.89	CLAYEY SILT	7.38	7.07	2.35
0.9	93.18	4.06	1.86	SAND	1.72	1.98	1.59
0.38	96.28	1.99	1.36	SAND	1.54	1.68	1.35
1.93	94.99	2.03	1.06	SAND	1.29	1.38	1.41
0.14	85.25	8.29	6.32	SAND	1.93	2.7	2.31
18.66	76.32	2.59	2.43	GRAVELLY SEDIMENT	1.41	1.1	2.39
0.29	88.77	6.18	4.76	SAND	2.21	2.62	2.02
30.21	65.9	1.95	1.94	GRAVELLY SEDIMENT	0.48	0.03	2.51
0	9.92	46.78	43.3	CLAYEY SILT	7.74	7.5	2.12
0.71	60.36	23.73	15.2	SILTY SAND	2.5	3.74	3.4
-9999	-9999	-9999	-9999	GRAVEL	-9999	-9999	-9999
0.12	28.99	43.4	27.49	SAND SILT CLAY	7	6.18	2.77
0	8.99	56.15	34.87	CLAYEY SILT	7.28	7.14	2.08
22.82	25.87	30.14	21.17	GRAVELLY SEDIMENT	4.52	3.66	4.68
-9999	-9999	-9999	-9999	GRAVEL	-9999	-9999	-9999
-9999	-9999	-9999	-9999	GRAVEL	-9999	-9999	-9999
16.07	73.18	6.41	4.35	GRAVELLY SEDIMENT	0.95	1.3	2.76
0	20.79	45.86	33.35	SAND SILT CLAY	7.29	6.82	2.44
0.06	27.76	44.12	28.06	SAND SILT CLAY	6.8	6.26	2.66
0	20.29	49.75	29.95	SAND SILT CLAY	7.08	6.63	2.39
0	5.8	43.97	50.24	SILTY CLAY	8.01	7.88	1.87
0	6.21	56.05	37.74	CLAYEY SILT	7.44	7.32	1.95
0	9.9	50.75	39.35	CLAYEY SILT	7.54	7.33	2.09
0	5.23	61.74	33.03	CLAYEY SILT	7.28	7.27	1.81
0	3.75	58.28	37.96	CLAYEY SILT	7.47	7.46	1.81

0	3.92	58.31	37.77	CLAYEY SILT	7.46	7.43	1.83
0.1	95.31	2.59	2	SAND	1.92	2.08	1.5
0.08	96.08	2.26	1.59	SAND	2.01	2.1	1.39
0	64.65	20.49	14.86	SILTY SAND	3.42	4.48	2.64
23.32	46.62	8.42	21.64	GRAVELLY SEDIMENT	1.75	2.49	4.87
0.87	95.13	1.91	2.08	SAND	1.86	2.04	1.53
14.14	80.54	3.02	2.3	GRAVELLY SEDIMENT	1.45	1.14	2.61
40.52	57.2	1.12	1.16	GRAVELLY SEDIMENT	0.42	-0.52	2.88
19.48	75.9	2.49	2.12	GRAVELLY SEDIMENT	1.04	0.76	2.39
35.61	62.28	1.13	0.98	GRAVELLY SEDIMENT	0.51	-0.08	2.42
0.47	54.74	26.66	18.13	SILTY SAND	3.62	4.77	2.93
0.24	71.58	15.25	12.93	SILTY SAND	2.22	3.51	3
0.69	96.03	1.91	1.37	SAND	1.57	1.72	1.36
0.09	42.91	29.11	27.89	SAND SILT CLAY	6.43	5.52	3.18
0	40.25	36.3	23.45	SAND SILT CLAY	6.22	5.73	2.68
0.22	51.37	33.14	15.27	SILTY SAND	3.79	4.74	2.85
2.5	92.49	2.85	2.16	SAND	1.43	1.59	1.67
35.79	60.99	1.76	1.46	GRAVELLY SEDIMENT	1.13	-0.29	3.15
1.37	92.18	3.45	3	SAND	1.49	1.78	1.8
1.22	57.19	24.89	16.7	SILTY SAND	2.61	4	3.38
1.35	75.73	13.91	9.01	SAND	1.53	2.69	2.94
0.08	56.55	26.21	17.17	SILTY SAND	3.46	4.71	2.83
0.34	45.17	31.63	22.86	SAND SILT CLAY	5.75	5.2	3.13
3.25	45.95	26.17	24.63	SAND SILT CLAY	4.61	4.97	3.43
0.04	63.82	20.99	15.15	SILTY SAND	2.88	4.31	2.84
2.05	83.15	9.07	5.74	SAND	1.55	2.24	2.52
14.94	80.64	2.67	1.75	GRAVELLY SEDIMENT	1.07	0.94	2.07
11.13	73.54	8.62	6.71	GRAVELLY SEDIMENT	1.58	2.06	2.87
9.16	87.45	1.74	1.66	SAND	1.36	1.21	1.92
38.62	58.05	1.78	1.56	GRAVELLY SEDIMENT	0.65	-0.42	3
0.92	82.8	9.19	7.08	SAND	1.52	2.33	2.59
56.68	39.03	2.5	1.78	GRAVEL	-3.8	-1.56	3.49
0.8	73.4	16.37	9.43	SILTY SAND	2.07	3.11	2.88
1.62	90.73	4.41	3.23	SAND	1.56	1.87	1.99
2.02	70.56	16	11.42	SILTY SAND	2.05	3.23	3.01
0.35	68.56	18.1	12.99	SILTY SAND	2.6	3.75	2.94
0.53	57.31	25.45	16.71	SILTY SAND	2.9	4.23	3.17
21.38	48.93	17.87	11.82	GRAVELLY SEDIMENT	0.97	2.22	3.92
16.45	59.91	13.51	10.12	GRAVELLY SEDIMENT	1.25	2.18	3.48
17.31	60.36	12.86	9.47	GRAVELLY SEDIMENT	0.96	1.97	3.45
0.48	36.23	35.78	27.51	SAND SILT CLAY	6.45	5.5	3.31
3.05	58.35	22.3	16.3	SILTY SAND	2.33	3.77	3.42
18.11	62.86	11.78	7.26	GRAVELLY SEDIMENT	1.48	1.8	3.41
0	3.71	59.16	37.12	CLAYEY SILT	7.45	7.4	1.83
0	3.36	67.47	29.16	CLAYEY SILT	7	7.06	1.8
0	3.47	61.1	35.43	CLAYEY SILT	7.46	7.42	1.72
7.1	83.25	6.03	3.61	SAND	1.51	1.75	2.36
0.23	92.69	4.01	3.06	SAND	1.86	2.19	1.75

0.82	93.87	2.71	2.6	SAND	1.69	1.96	1.66
8.12	89.54	1.19	1.16	SAND	1	0.94	1.55
3.19	95.31	0.82	0.69	SAND	1.21	1.13	1.11
8.65	87.89	1.78	1.69	SAND	1.45	1.39	1.68
0	93.81	4.04	2.15	SAND	1.41	1.71	1.63
0.1	99.09	0.46	0.35	SAND	1.31	1.26	0.75
0.67	97.91	0.69	0.74	SAND	1.19	1.17	1.02

SKEWNESS	KURTOSIS	PHI_11	PHI_10	PHI_9	PHI_8	PHI_7	PHI_6	PHI_5	PHI_4
-0.04	-1.52	3.58	5.52	10.66	14.1	14.93	9.77	2.85	0.03
-0.06	-0.58	3.63	5.47	11.12	16.07	19.15	7.14	6.59	18.28
-0.19	-0.4	5.87	8.41	15.6	17.25	17.61	5.55	4.82	15.09
1.4	15.51	0.33	0.43	0.69	0.76	0.9	0.56	0.41	0.83
2.49	35.56	0.2	0.26	0.4	0.44	0.49	0.34	0.28	0.44
2.8	47.72	0.12	0.14	0.23	0.25	0.27	0.14	0.19	0.52
2.44	40.49	0.15	0.18	0.25	0.26	0.17	0.11	0.09	0.08
0.31	1.09	0.23	0.32	0.55	0.63	0.37	0.12	0.1	0.42
1.3	10.13	0.43	0.57	0.95	1.1	1.11	0.8	0.23	0.2
-0.52	1.54	6.9	10.68	20.16	25.21	20.08	4.43	2.16	2.83
-0.34	0.15	5.06	7.73	14.21	19.62	18.93	10.34	5.68	5.35
-0.39	1.34	6.59	10.09	18.97	24.17	17.38	9.61	5.38	2.87
-0.42	0.92	6.68	9.94	17.47	21.41	19.06	10.21	3.22	2.94
-0.32	-0.25	5.16	8.16	15.38	18.92	18.33	5.81	5.27	5.75
-0.42	1.38	5.92	9.28	17.16	22.02	22.28	10.14	3.47	3.18
0.32	-0.77	2.95	4.26	7.57	9.1	8.56	4.41	3.16	3.53
0.01	-1.32	4.17	6.39	11.91	17.97	11.63	3.83	3.31	4.46
2.11	26.29	0.18	0.24	0.37	0.44	0.43	0.39	0.26	0.07
0.63	0.38	2	2.83	4.98	5.91	4.8	1.79	1.65	2.34
1.05	3.82	0.15	0.2	0.36	0.43	0.36	0.16	0.22	0.38
0.76	9.38	0.26	0.31	0.45	0.46	0.46	0.23	0.25	0.58
0.58	0.98	1.4	2.07	3.86	5.15	3.51	0.75	0.81	3.16
-0.41	0.91	7.14	10.5	19.24	21.3	20.07	4.45	3.86	7.44
1.28	9.4	0.3	0.5	1.06	1.54	1.49	0.47	0.57	2.19
1.64	16.56	0.33	0.41	0.62	0.64	0.55	0.35	0.45	1.61
1.33	13.25	0.23	0.31	0.52	0.64	0.72	0.28	0.39	1.02
0.95	2.83	1.25	1.82	3.25	4.09	3.15	0.52	0.54	4.64
0.31	2.84	0.51	0.73	1.2	1.17	0.85	0.33	0.25	1.51
1.1	4.89	0.98	1.39	2.39	2.75	2.18	0.62	0.64	5.5
0.45	2.73	0.37	0.59	0.98	1.03	0.58	0.18	0.16	0.45
-0.43	1.21	8.34	12.34	22.62	25.51	15.74	3.13	2.39	6.05
0.25	-1.14	2.97	4.39	7.84	10.03	8.99	2.25	2.47	7.19
-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
-0.23	-0.67	4.76	7.57	15.17	22.45	14.22	3.77	2.96	12.93
-0.23	0.6	6.8	10.08	17.99	20.94	20.68	9.12	5.4	5.63
-0.14	-1.32	4.08	6	11.09	12.99	11.28	3.33	2.54	6.03
-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
0.61	1.92	0.85	1.23	2.26	2.79	2.41	0.64	0.58	4.76
-0.28	-0.24	6.29	9.72	17.35	23.53	16.74	3.64	1.94	11.64
-0.17	-0.64	5.38	7.93	14.76	18.4	17.58	4.33	3.8	12.79
-0.2	-0.38	5.43	8.54	15.97	21.7	16.59	6.02	5.45	11.66
-0.35	1.26	10.09	15.12	25.02	25.82	12.95	2.35	2.85	4.13
-0.13	0.19	7.28	10.61	19.85	21.72	17.34	11.44	5.54	3.96
-0.31	0.56	7.23	11.45	20.66	23.23	19.03	4.34	4.14	5.56
-0.13	0.86	5.92	9.24	17.88	23.53	23.81	10.62	3.79	3.22
-0.14	1.05	7.4	11.02	19.55	22.58	21.2	11.75	2.75	2.39

-0.18	1.17	7.03	10.9	19.84	22.78	21.3	9.92	4.32	2.45
1.49	12.2	0.45	0.6	0.95	1.08	0.96	0.37	0.19	3.15
1.46	13.12	0.33	0.46	0.8	0.91	0.73	0.39	0.23	5.06
0.42	-0.51	2.82	4.32	7.71	8.82	7.47	2.21	2	25.07
0.1	-0.99	6.99	6.82	7.84	5.19	2.3	0.51	0.42	3.93
1.33	11.74	0.48	0.64	0.97	0.93	0.55	0.18	0.26	6.27
0	2.33	0.45	0.67	1.18	1.38	1.05	0.39	0.21	3.74
0.12	0.24	0.26	0.35	0.56	0.59	0.34	0.1	0.09	0.63
0.36	2.93	0.44	0.63	1.07	1.06	0.9	0.33	0.21	1.51
0.16	1.41	0.23	0.29	0.46	0.48	0.39	0.11	0.15	0.65
0.21	-1.06	3.44	5.3	9.4	11.96	9.87	2.1	2.73	13.64
0.49	-0.39	2.51	3.7	6.72	8.35	5.62	0.65	0.63	5.84
1.56	16.24	0.3	0.41	0.66	0.71	0.6	0.36	0.24	1.64
-0.02	-1.38	5.43	8	14.45	16.87	9.24	1.93	1.07	6.75
0.04	-1.13	4.3	6.63	12.52	15.26	14.41	3.65	2.98	20.2
0.15	-1.16	2.43	4.06	8.78	13.61	13.19	3.48	2.87	7.6
1.32	11.32	0.45	0.63	1.08	1.16	1	0.36	0.34	0.87
0.04	-0.19	0.3	0.42	0.74	0.78	0.69	0.15	0.14	0.47
1.42	9.7	0.66	0.88	1.46	1.48	1.14	0.42	0.41	0.91
0.21	-1.22	3.05	4.71	8.94	11.13	9.11	2.72	1.93	5.58
0.61	0.29	1.62	2.52	4.87	6.41	4.74	1.36	1.41	5.65
0.27	-1.02	3.17	4.87	9.12	11.15	9.49	3.37	2.19	12.21
0.03	-1.33	4.21	6.39	12.26	16.88	9.66	2.42	2.68	8.07
-0.02	-1.12	4.78	6.96	12.89	14.95	8.92	0.99	1.31	6.24
0.38	-0.77	2.88	4.32	7.95	10.32	7.7	1.26	1.71	9.44
0.81	2.21	1.13	1.66	2.95	3.85	3.55	0.81	0.85	4.29
0.61	4.95	0.37	0.52	0.85	1.09	0.98	0.33	0.28	1.04
0.55	1.25	1.3	1.88	3.52	3.96	3.28	0.75	0.62	2.51
0.39	6.33	0.33	0.48	0.85	0.88	0.57	0.14	0.15	1
0.15	0.3	0.27	0.44	0.84	0.83	0.66	0.15	0.14	0.49
0.89	2.16	1.4	2.02	3.66	4.19	3.14	0.95	0.9	1.42
0.45	0.13	0.35	0.51	0.92	1.09	0.91	0.24	0.27	1.39
0.53	-0.03	1.7	2.62	5.11	6.99	6.51	1.53	1.34	3.67
1.08	5.97	0.66	0.94	1.64	1.92	1.58	0.41	0.5	2.1
0.48	-0.16	2.27	3.31	5.84	6.93	5.41	1.9	1.75	4.85
0.43	-0.49	2.46	3.66	6.87	8.18	6.78	1.66	1.49	7.76
0.24	-1.1	3.13	4.85	8.74	10.43	8.98	2.95	3.09	6.15
0.31	-0.86	2.19	3.33	6.29	8.02	6.19	1.99	1.67	2.83
0.44	-0.26	1.84	2.83	5.45	6.35	5.11	1.03	1.02	2.87
0.5	-0.07	1.8	2.7	4.98	5.74	4.83	1.14	1.16	2.74
-0.1	-1.28	5.38	7.96	14.17	16.15	11.52	4.73	3.38	4.55
0.25	-1.08	3.08	4.59	8.64	10.14	7.5	2.04	2.62	4.47
0.3	0.15	1.38	2.04	3.84	4.35	4.37	1.65	1.41	2.85
-0.1	0.53	7.08	10.63	19.42	23.37	20.61	7.91	7.27	2.93
0.04	0.24	5.49	8.18	15.49	20.91	24.26	11.47	10.84	2.71
-0.1	0.78	6.08	9.76	19.6	27.02	20.62	7.6	5.86	2.82
0.6	3.43	0.71	1.04	1.87	2.36	2.17	0.76	0.75	1.41
1.39	8.78	0.66	0.91	1.5	1.75	1.46	0.45	0.35	2.05

1.45	11.21	0.61	0.78	1.22	1.27	0.88	0.34	0.23	1.54
1.02	11.6	0.27	0.34	0.54	0.49	0.38	0.14	0.18	0.98
1.7	26.46	0.18	0.21	0.3	0.29	0.26	0.14	0.13	0.16
0.87	9.72	0.4	0.52	0.77	0.7	0.56	0.24	0.28	1.53
1.6	11.36	0.4	0.61	1.14	1.41	1.23	0.69	0.72	0.44
3	65.27	0.1	0.11	0.14	0.14	0.12	0.1	0.1	0.06
2.48	38.79	0.18	0.23	0.33	0.37	0.19	0.07	0.06	0.09

PHI_3	PHI_2	PHI_1	PHI_0	PHIM1	PHIM2	PHIM3	PHIM4	PHIM5	ANALYST
0.02	0.01	38.42	0	0.12	0	0	0	0	KMCMULLEN
7.89	2.6	1.21	0.78	0.06	0	0	0	0	KMCMULLEN
4.85	2.38	1.55	0.93	0.1	0	0	0	0	KMCMULLEN
55.55	32.93	4.51	1.31	0.28	0.53	0	0	0	KMCMULLEN
68.93	26.85	1.09	0.28	0	0	0	0	0	KMCMULLEN
44.33	53.06	0.6	0.15	0	0	0	0	0	KMCMULLEN
0.61	18.55	66.51	10.27	2.48	0.29	0	0	0	KMCMULLEN
4.2	18.79	20.46	6.91	7.87	7.67	12.55	18.8	0	KMCMULLEN
2.61	37.2	40.42	9.6	2.08	2.71	0	0	0	KMCMULLEN
2.62	2.72	1.67	0.57	0	0	0	0	0	KMCMULLEN
4.33	3.63	3.05	2.01	0.06	0	0	0	0	KMCMULLEN
1.88	1.46	0.98	0.61	0	0	0	0	0	KMCMULLEN
3.3	3.09	1.42	1.26	0	0	0	0	0	KMCMULLEN
6.08	4.93	3.04	3.01	0.16	0	0	0	0	KMCMULLEN
2.31	2.09	1.24	0.91	0	0	0	0	0	KMCMULLEN
30.43	22.18	2.44	0.78	0.03	0.6	0	0	0	KMCMULLEN
20.71	12.93	2.37	0.28	0	0	0	0	0	KMCMULLEN
0.26	26.36	57.01	11.72	2.28	0	0	0	0	KMCMULLEN
13.11	41.82	13.28	4.71	0.8	0	0	0	0	KMCMULLEN
7.55	5.69	1.69	1.03	1.09	0.66	9.07	70.96	0	KMCMULLEN
6.91	43.39	28.95	7.75	4.35	5.66	0	0	0	KMCMULLEN
22.92	30.66	12.18	6.88	4.2	2.44	0	0	0	KMCMULLEN
2.36	1.32	1.02	1.29	0	0	0	0	0	KMCMULLEN
28.38	47.89	13.04	1.69	0.41	0.49	0	0	0	KMCMULLEN
21.19	51.68	18.48	3.32	0.38	0	0	0	0	KMCMULLEN
15.75	42.57	29.56	6.09	1.61	0.32	0	0	0	KMCMULLEN
27.6	45.17	6.17	1.67	0.14	0	0	0	0	KMCMULLEN
18.32	42.82	11.79	1.88	2.54	10.36	5.76	0	0	KMCMULLEN
42.61	31.92	7.7	1.04	0.29	0	0	0	0	KMCMULLEN
2.57	29.41	26.29	7.18	3.99	7.58	18.64	0	0	KMCMULLEN
1.55	1.34	0.9	0.09	0	0	0	0	0	KMCMULLEN
7.74	16.35	22.28	6.8	0.71	0	0	0	0	KMCMULLEN
-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	KMCMULLEN
5.95	6.18	3.19	0.75	0.12	0	0	0	0	KMCMULLEN
1.51	1.13	0.52	0.2	0	0	0	0	0	KMCMULLEN
3.31	7.7	5.16	3.68	2.28	3.54	17	0	0	KMCMULLEN
-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	KMCMULLEN
-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	KMCMULLEN
10.11	23.14	23.33	11.85	6.89	6.69	2.48	0	0	KMCMULLEN
5.82	2.14	1.01	0.18	0	0	0	0	0	KMCMULLEN
9.34	3.09	1.81	0.74	0.06	0	0	0	0	KMCMULLEN
5.91	1.79	0.66	0.28	0	0	0	0	0	KMCMULLEN
1.12	0.38	0.16	0.01	0	0	0	0	0	KMCMULLEN
1.9	0.23	0.11	0.02	0	0	0	0	0	KMCMULLEN
3.16	0.79	0.33	0.07	0	0	0	0	0	KMCMULLEN
1.41	0.34	0.24	0.02	0	0	0	0	0	KMCMULLEN
0.57	0.38	0.35	0.06	0	0	0	0	0	KMCMULLEN

0.59	0.38	0.33	0.16	0	0	0	0	0	KMCMULLEN
39.06	38.54	12.92	1.65	0.1	0	0	0	0	KMCMULLEN
41.38	36.07	12.2	1.37	0.08	0	0	0	0	KMCMULLEN
30.01	7.68	1.71	0.19	0	0	0	0	0	KMCMULLEN
10.57	21.85	8.12	2.16	1.32	2.32	2.62	17.05	0	KMCMULLEN
34.15	40.96	11.83	1.92	0.42	0.45	0	0	0	KMCMULLEN
18.54	40.91	14.39	2.95	1.66	0.94	2.5	9.05	0	KMCMULLEN
9.26	30.03	13.34	3.94	3.92	9.58	5.69	21.33	0	KMCMULLEN
12.42	32.82	23.8	5.35	3.54	6.26	9.69	0	0	KMCMULLEN
9.31	30.27	15.59	6.47	10.42	9.99	9.26	5.95	0	KMCMULLEN
26.12	11.93	2.55	0.51	0.47	0	0	0	0	KMCMULLEN
20.54	32.91	10.7	1.59	0.24	0	0	0	0	KMCMULLEN
22.05	53.51	16.81	2.03	0.08	0.61	0	0	0	KMCMULLEN
19.01	13.41	2.78	0.97	0.09	0	0	0	0	KMCMULLEN
14.97	4.19	0.72	0.17	0	0	0	0	0	KMCMULLEN
27.1	12.96	3.03	0.67	0.22	0	0	0	0	KMCMULLEN
9.63	60.43	19.43	2.12	0.14	2.36	0	0	0	KMCMULLEN
11.79	39.55	7.4	1.79	0.96	2.23	6.1	26.51	0	KMCMULLEN
13.78	56.52	18.33	2.65	0.96	0.42	0	0	0	KMCMULLEN
7.24	26.34	13.33	4.7	0.9	0.31	0	0	0	KMCMULLEN
5.84	33.36	26.64	4.23	0.84	0.51	0	0	0	KMCMULLEN
31.44	11.4	1.29	0.21	0.08	0	0	0	0	KMCMULLEN
16.62	16.1	3.36	1.02	0.34	0	0	0	0	KMCMULLEN
18.58	17.65	2.61	0.87	0.58	2.67	0	0	0	KMCMULLEN
37.54	14.46	1.76	0.62	0.04	0	0	0	0	KMCMULLEN
13.64	38.27	22.08	4.88	1.02	1.02	0	0	0	KMCMULLEN
10.69	36.34	25.27	7.3	5.4	7.7	1.84	0	0	KMCMULLEN
17.09	36.08	13.2	4.65	3.79	7.34	0	0	0	KMCMULLEN
14.01	49.16	20.4	2.88	1.42	2.63	5.11	0	0	KMCMULLEN
7.48	34.83	11.16	4.08	4.08	4.52	8.41	21.6	0	KMCMULLEN
8.94	48.58	19.61	4.25	0.92	0	0	0	0	KMCMULLEN
10.17	15.93	9.52	2.03	0	0	8.39	48.29	0	KMCMULLEN
22.11	27.65	16.28	3.69	0.8	0	0	0	0	KMCMULLEN
26.82	30.52	26.58	4.7	0.96	0.67	0	0	0	KMCMULLEN
18.58	31.43	12.65	3.05	1.47	0.55	0	0	0	KMCMULLEN
27.9	22.61	8.1	2.19	0.35	0	0	0	0	KMCMULLEN
17.2	23.1	8.83	2.02	0.53	0	0	0	0	KMCMULLEN
4.16	12.8	16.24	12.9	8.97	9.25	3.16	0	0	KMCMULLEN
7.13	21.92	18.36	9.63	9.96	6.5	0	0	0	KMCMULLEN
5.84	18.2	20.89	12.69	11.45	5.86	0	0	0	KMCMULLEN
4.74	18.6	7.06	1.28	0.48	0	0	0	0	KMCMULLEN
10.35	24.72	14.24	4.57	2.62	0.43	0	0	0	KMCMULLEN
13.26	28.66	13.68	4.41	2.81	3.69	11.61	0	0	KMCMULLEN
0.34	0.21	0.15	0.09	0	0	0	0	0	KMCMULLEN
0.32	0.17	0.11	0.06	0	0	0	0	0	KMCMULLEN
0.31	0.16	0.13	0.05	0	0	0	0	0	KMCMULLEN
21.37	36.01	21.21	3.25	1.99	1.45	3.65	0	0	KMCMULLEN
34.72	43	11.93	0.99	0.23	0	0	0	0	KMCMULLEN

28.27	48.29	14.38	1.39	0.34	0.48	0	0	0	KMCMULLEN
5.57	41.24	32.34	9.41	4.59	3.52	0	0	0	KMCMULLEN
2.31	58.16	29.5	5.17	3.19	0	0	0	0	KMCMULLEN
9.21	64.72	8.86	3.58	5.13	3.52	0	0	0	KMCMULLEN
14.59	48.62	29.75	0.41	0	0	0	0	0	KMCMULLEN
2.12	67.68	27.83	1.41	0.1	0	0	0	0	KMCMULLEN
1.38	58.43	34.43	3.58	0.67	0	0	0	0	KMCMULLEN

2013 LISMARC Sediment Texture Sampling Log

LABNO	STATIONID	PROJECT	CRUISEID	AREA	LATITUDE
BA427	NB-1	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.161233
BA428	NB-2	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.14576
BA429	NB-3	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.127457
BA430	NB-4	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.102401
BA431	NB-5	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.09715
BA432	NB-6	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.082316
BA433	NB-7	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.052833
BA434	NB-8	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.031902
BA435	NB-9	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.003158
BA436	NB-10	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.044267
BA437	NB-11	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.010452
BA438	NB-12	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.050423
BA439	NB-13	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.025222
BA440	NB-14	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.035027
BA441	NB-15	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.049263
BA442	NB-16	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.073295
BA443	NB-17	LISMARC PILOT	2013-009-FA	LONG ISLAND SOUND	41.102083

LONGITUDE	DEPTH_M	T_DEPTH	B_DEPTH	DEVICE	MONTH	DAY	YEAR	WEIGHT
-73.0777	-9999	0	2	SEABOSS	5	21	2013	22.3762
-73.074447	12.8	0	2	SEABOSS	5	21	2013	15.8413
-73.06893	15.2	0	2	SEABOSS	5	22	2013	20.5393
-73.065672	18.1	0	2	SEABOSS	5	22	2013	18.5540
-73.051167	22	0	2	SEABOSS	5	22	2013	14.0969
-73.05125	24.7	0	2	SEABOSS	5	22	2013	17.8459
-73.005233	36.6	0	2	SEABOSS	5	22	2013	20.2694
-73.018686	39.9	0	2	SEABOSS	5	22	2013	33.6454
-73.035755	25.5	0	2	SEABOSS	5	22	2013	14.3653
-73.043667	36	0	2	SEABOSS	5	23	2013	29.2921
-73.060565	34.2	0	2	SEABOSS	5	22	2013	16.8075
-73.05964	34.1	0	2	SEABOSS	5	23	2013	20.9372
-73.081788	46	0	2	SEABOSS	5	22	2013	24.4968
-73.142362	36.6	0	2	SEABOSS	5	23	2013	15.7156
-73.157843	26.5	0	2	SEABOSS	5	23	2013	14.8618
-73.156898	20.1	0	2	SEABOSS	5	23	2013	17.0616
-73.153117	13.1	0	2	SEABOSS	5	23	2013	23.9151

ZGRAVEL	ZSAND	ZSILT	ZCLAY	SEDCLASS	MEDIAN	MEAN	STDEV	SKEWNESS
0	51.62	32.26	16.11	SILTY SAND	3.95	5.06	2.52	0.16
0	7.69	70.23	22.07	CLAYEY SILT	6.55	6.58	1.82	-0.12
0	35.65	44.97	19.38	SANDY SILT	6.06	5.61	2.56	-0.09
0	15.98	55.4	28.6	CLAYEY SILT	6.97	6.55	2.37	-0.38
0	14.43	51.12	34.45	CLAYEY SILT	7.22	6.84	2.2	-0.26
0	19.37	54.5	26.12	CLAYEY SILT	6.69	6.32	2.37	-0.25
0	16.32	57.8	25.88	CLAYEY SILT	6.84	6.47	2.24	-0.27
0	68.84	20.77	10.39	SILTY SAND	2.59	3.7	2.65	0.48
0	1.42	63.85	34.73	CLAYEY SILT	7.36	7.41	1.46	-0.01
0	52.07	32.4	15.53	SILTY SAND	3.85	4.86	2.6	0.22
2.2	44.55	34.45	18.79	SILTY SAND	4.79	4.63	3.29	-0.02
0	33.75	47.3	18.96	SANDY SILT	5.74	5.69	2.32	0.07
3.1	55.86	26.67	14.38	SILTY SAND	3.2	4.09	3.1	0.13
0	18.01	53.02	28.96	CLAYEY SILT	6.89	6.51	2.29	-0.23
0	24.75	48.43	26.82	SAND SILT CLAY	6.7	6.3	2.35	-0.14
0	19.34	56.32	24.33	CLAYEY SILT	6.54	6.27	2.26	-0.17
0	29.89	50.55	19.54	SANDY SILT	6.08	5.63	2.58	-0.16

KURTOSIS	PHI_11	PHI_10	PHI_9	PHI_8	PHI_7	PHI_6	PHI_5	PHI_4
-0.8	3.67	5.16	8.48	10.61	12.27	4.42	4.96	33.87
0.41	4.46	6.77	12.29	17.58	23.04	20.68	8.93	5.24
-0.75	3.98	5.94	10.75	15.05	16.57	6.65	6.7	21.57
-0.04	5.65	8.78	15.99	20.78	18.96	11.79	3.87	3.34
-0.46	7.36	10.97	18.46	20.05	14.79	7.75	8.53	8.68
-0.42	5.15	7.91	14.72	17.98	18.77	9.88	7.87	7.79
-0.38	4.92	7.82	14.74	21.4	17.3	11.86	7.24	4.85
-0.41	2.06	3.16	5.85	7.56	7.22	3.04	2.95	6.05
-0.02	6.6	10.48	19.75	23.99	24.09	14.61	1.16	1.22
-1.18	3.04	4.68	8.81	11.73	11.59	4.94	4.14	14.27
-1.28	3.5	5.44	10.99	14.85	11.29	4.19	4.12	4.01
-1.06	3.78	5.79	10.62	14.48	14.1	9.42	9.3	21.51
-0.96	2.79	4.24	8.26	10.28	9.78	3.53	3.08	11.23
-0.65	5.51	8.65	16.57	19.07	18.43	7.67	7.85	5.5
-0.96	5.17	8.18	15.13	17.86	17.79	6.02	6.76	13.51
-0.56	4.77	7.45	13.65	17.21	18.32	10.89	9.9	10.34
-0.63	3.84	5.78	11.18	14.57	17.2	9.3	9.48	11.73

PHI_3	PHI_2	PHI_1	PHI_0	PHIm1	PHIm2	PHIm3	PHIm4	PHIm5
12.22	2.21	1.71	1.61	0	0	0	0	0
1.09	0.75	0.42	0.19	0	0	0	0	0
6.78	3.34	2.08	1.88	0	0	0	0	0
4.95	6.57	0.92	0.2	0	0	0	0	0
4.21	1.03	0.42	0.09	0	0	0	0	0
6.28	3.53	1.5	0.27	0	0	0	0	0
7.72	3.26	0.43	0.06	0	0	0	0	0
31.25	27.55	3.15	0.84	0	0	0	0	0
0.11	0.05	0.03	0.01	0	0	0	0	0
31.05	5.76	0.76	0.23	0	0	0	0	0
7.94	23.75	7.16	1.69	0.23	1.97	0	0	0
10.19	1.45	0.59	0.01	0	0	0	0	0
15.19	22.07	5.19	2.18	1.17	1.93	0	0	0
11.06	1.04	0.32	0.09	0	0	0	0	0
9.58	1.22	0.37	0.07	0	0	0	0	0
5.41	2.65	0.82	0.12	0	0	0	0	0
10.24	3.15	2.36	2.41	0	0	0	0	0

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Appendix 4: Sediment Environment Acquisition Cruise Details

For sediment environment we used data from the sediment sampling surveys (s. Appendix 3 for details on the sediment sampling survey) and subbottom survey data described here..

The subbottom surveys were conducted using a high-resolution Chirp subbottom profiler system consisting of an EdgeTech 424 tow fish and an EdgeTech P3200 acquisition unit with Discovery software (Fig. A4-1).

Lamont EdgeTech Chirp 424 subbottom profiler system (left) and EdgeTech Discovery software (right).

The system was operated using an acoustic sweep signal between 4-24 kHz that results in a nominal high vertical resolution of 0.1-0.2m. The horizontal resolution depends on the survey speed. The system transmits data at a rate of 4-5 pings/second. At survey speeds of 5-6 knots these transmission rates results in an along track spacing of traces between 0.5 and 1m. Data were recorded in EdgeTech's proprietary jsf format as well as in Standard SEGY format.

The subbottom data are geo-referenced using a differential GPS system, which provides horizontal accuracy <1m. The offset between the ships DGPS antenna and the actual towed fish location was determined for later correction of the positions

Files were recorded continuously along a line and named <survey><orientation><line><part>, for example: LIS1301w100a, with orientation indicated by w (east-west) or n (north-south), line numbers consecutively numbered in the order of acquisition, and different segments marked a, b, c, if these segments are part of a continuous line that was collected into different parts or has been repeated.

The original plan proposed to acquire subbottom data along a grid with a spacing of 500 m in EW direction and 1000 m in NS direction over the entire pilot area except the shallowest areas (<2-3m), but it was modified to cover most of the pilot area while minimizing the efforts and resulting costs. The actual subbottom survey was performed in three stages (Fig. A4-6, Table A4-1):

(1) System test (LIS1201).
To test the Chirp subbottom system on the Stony Brook vessels and optimize acquisition parameters we conducted a field test in June 2012, which covered mainly the harbor area of Port Jefferson (Fig.A4-6; green line).

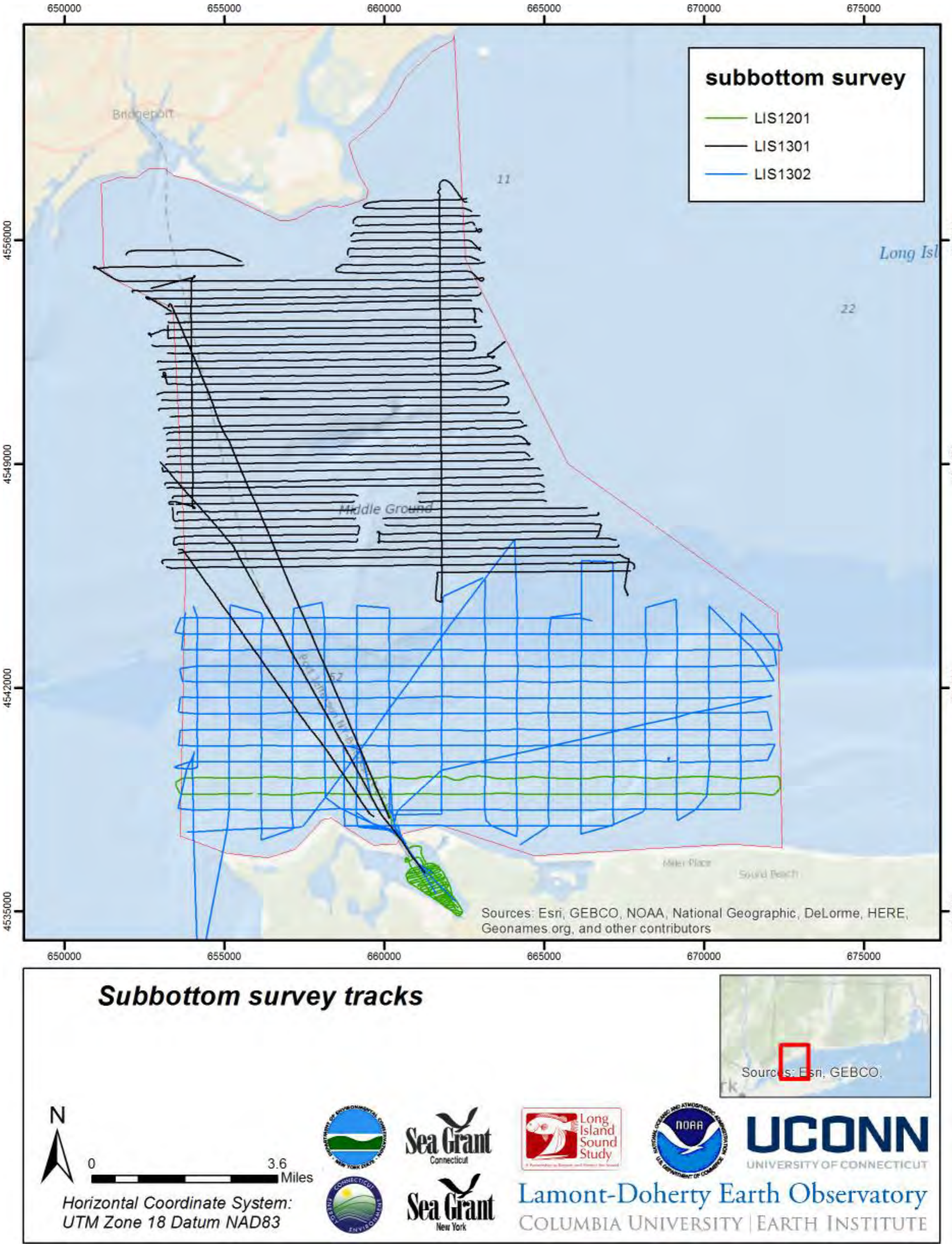
(2) Measurements in tandem with multibeam collection (LIS1301)
For data collection in northern areas (D and E) we towed the subbottom system from the *R/V Seawolf* while the vessel is collecting multibeam data (LIS1301; Fig A4-6 black lines). This resulted in denser (~ 250 m) line spacing in east-west direction and fewer crossing north-south lines.

(3) Survey of the Southern section (LIS1302).
The original plan was that the NOAA vessel *T Jefferson* would collect subbottom data in the area C as part of their multibeam survey, but they were unable to do so. Hence we stretched the surveys planned for the A and B areas in a way that they covered most of area C as well (LIS1302; Fig. A4-6 blue lines). To combine the different surveys we acquired lines that connect the different surveys.

In total we collected 179 subbottom lines, which represent 1036km of subbottom data:.

Table A3.3: Subbottom field data collection details.

Survey	Survey date	Field days	Vessel	# lines	Length/km
LIS1201	June 4 -5 2012	2 days	Pritchard	34	70
LIS1301	March 18-27 2013	8 days	Seawolf	73	550
LIS1302	April 16–25 2013	8 days	Pritchard	72	416
total		**18**		**179**	**1036**

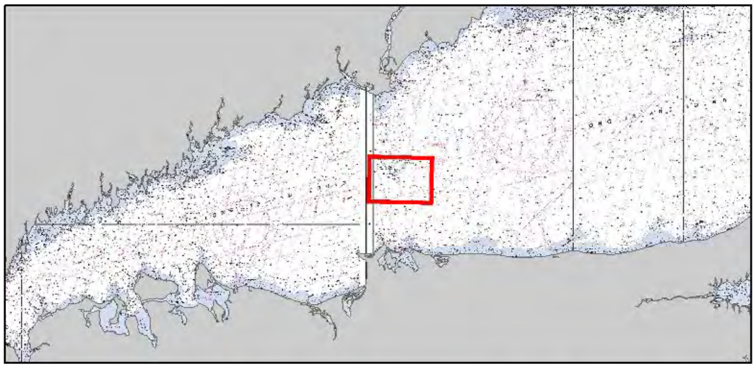


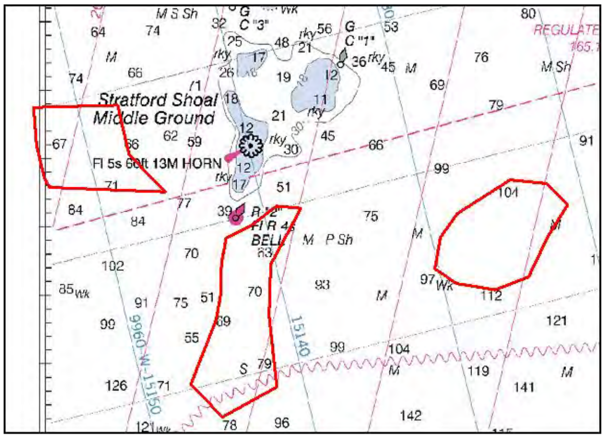
Map of the new subbottom profiles collected as part of the pilot project. Different colors indicate the different surveys described in the text.

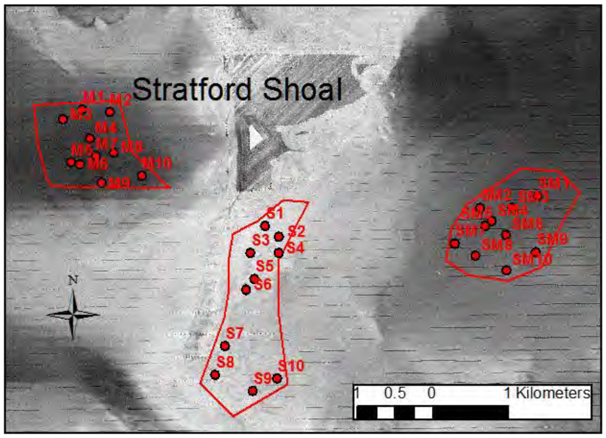
Appendix 5: Ecological Characterization Cruise Details

Stony Brook University:

Station locations. S = Sand, M = Mud, and SM = sandy mud areas.







Field data for each sampling location.

Station ID	Sample ID	Latitude	Longitude	Date	Water Depth (m)	Grab Depth (cm)
M1	L010	41.0640333	-73.1282833	6/18/2013	21.4	9.5
M2	L009	41.0636167	-73.1239667	6/18/2013	20.7	9.5
M3	L011	41.0628500	-73.1313833	6/18/2013	21	9.5
M4	L012	41.0605167	-73.1272000	6/18/2013	20.3	9.5
M5	L013	41.0577500	-73.1302500	6/18/2013	21.3	9.5
M6	L014	41.0574500	-73.1288833	6/18/2013	21.3	9.5
M7	L015	41.0583833	-73.1262833	6/18/2013	20.9	9.5

Station ID	Sample ID	Latitude	Longitude	Date	Water Depth (m)	Grab Depth (cm)
M8	L008	41.0587500	-73.1234500	6/18/2013	20.9	8.5
M9	L016	41.0551667	-73.1255000	6/18/2013	21.9	9.5
M10	L007	41.0559333	-73.1191000	6/18/2013	21.4	9.5
S1	L006	41.0496167	-73.0998000	6/18/2013	20.7	6
S2	L005	41.0482833	-73.0976500	6/18/2013	22.6	6.5
S3	L003	41.0464167	-73.1022333	6/18/2013	21.6	7
S4	L004	41.0463450	-73.0978410	6/18/2013	22.9	6
S5	L017	41.0433000	-73.1016833	6/18/2013	21.6	6.5
S6	L002	41.0420500	-73.1030167	6/18/2013	22.9	6
S7	L018	41.0353667	-73.1065833	6/18/2013	22.3	5
S8	L001	41.0319333	-73.1082167	6/18/2013	21.2	5
S9	L020	41.0299333	-73.1023167	6/18/2013	24	5
S10	L019	41.0313667	-73.0984500	6/18/2013	26.4	5
SM1	L029	41.0524833	-73.0565500	9/11/2013	32.7	10
SM2	L027	41.0512000	-73.0657833	9/11/2013	32.4	10
SM3	L028	41.0511500	-73.0607000	9/11/2013	32.6	10
SM4	L026	41.0495833	-73.0640000	9/11/2013	32.7	10
SM5	L025	41.0490333	-73.0650500	9/11/2013	32.7	10
SM6	L030	41.0479167	-73.0617667	9/11/2013	33.3	10
SM7	L024	41.0470167	-73.0699333	9/11/2013	32.7	10
SM8	L023	41.0455167	-73.0666667	9/11/2013	32.9	10
SM9	L022	41.0457667	-73.0571333	9/11/2013	33	10

Station ID	Sample ID	Latitude	Longitude	Date	Water Depth (m)	Grab Depth (cm)
SM10	L021	41.0436667	-73.0618333	9/11/2013	33	10

Appendix 5: LISMARC Ecological Characterization Acquisition Cruise Details

2012 SEABOSS Photo Log, October, 2012
2012 SEABOSS Video Log, October, 2012
2012 ISIS Log, December, 2012
2013 SEABOSS Photo Log, May, 2013
2013 SEABOSS Video Log, May, 2013
2013 K2 ROV Summary Log, May, 2013

2012 SEABOSS Photo Log, October, 2012

STATION	PHOTO	ARCHIVE.JPG	LATITUDE	LONGITUDE	DATE	DEVICE
SB-03-1	SB-03-1-1	IMG_2994.JPG	41.132567	-73.09055	10/10/12	SEABOSS
SB-03-1	SB-03-1-2	IMG_2995.JPG	41.13255	-73.090617	10/10/12	SEABOSS
SB-03-1	SB-03-1-3	IMG_2996.JPG	41.13255	-73.090733	10/10/12	SEABOSS
SB-03-2	SB-03-2-1	IMG_2997.JPG	41.1344	-73.090817	10/10/12	SEABOSS
SB-03-3	SB-03-3-1	IMG_3000.JPG	41.138717	-73.086317	10/10/12	SEABOSS
SB-03-3	SB-03-3-2	IMG_3001.JPG	41.138667	-73.0864	10/10/12	SEABOSS
SB-03-3	SB-03-3-3	IMG_3002.JPG	41.138633	-73.086433	10/10/12	SEABOSS
SB-03-3	SB-03-3-4	IMG_3003.JPG	41.1386	-73.0865	10/10/12	SEABOSS
SB-04-1	SB-04-1-1	IMG_3203.JPG	41.122792	-73.13823	10/11/12	SEABOSS
SB-04-1	SB-04-1-2	IMG_3204.JPG	41.1228	-73.138063	10/11/12	SEABOSS
SB-04-1	SB-04-1-3	IMG_3205.JPG	41.122792	-73.137972	10/11/12	SEABOSS
SB-04-1	SB-04-1-4	IMG_3207.JPG	41.122747	-73.137615	10/11/12	SEABOSS
SB-04-1	SB-04-1-5	IMG_3208.JPG	41.122747	-73.137537	10/11/12	SEABOSS
SB-04-2	SB-04-2-1	IMG_3209.JPG	41.119787	-73.1379	10/11/12	SEABOSS
SB-04-2	SB-04-2-2	IMG_3210.JPG	41.119787	-73.137812	10/11/12	SEABOSS
SB-04-2	SB-04-2-3	IMG_3212.JPG	41.119773	-73.137617	10/11/12	SEABOSS
SB-04-2	SB-04-2-4	IMG_3213.JPG	41.119747	-73.137473	10/11/12	SEABOSS
SB-04-2	SB-04-2-5	IMG_3214.JPG	41.119732	-73.137405	10/11/12	SEABOSS
SB-04-3	SB-04-3-1	IMG_3217.JPG	41.121652	-73.134355	10/11/12	SEABOSS
SB-04-3	SB-04-3-2	IMG_3218.JPG	41.12163	-73.134288	10/11/12	SEABOSS
SB-04-3	SB-04-3-3	IMG_3219.JPG	41.121605	-73.13414	10/11/12	SEABOSS
SB-04-3	SB-04-3-4	IMG_3220.JPG	41.121583	-73.134048	10/11/12	SEABOSS
SB-04-3	SB-04-3-5	IMG_3221.JPG	41.121553	-73.133948	10/11/12	SEABOSS
SB-05-1	SB-05-1-1	IMG_3301.JPG	41.113405	-73.119163	10/11/12	SEABOSS
SB-05-1	SB-05-1-2	IMG_3302.JPG	41.113402	-73.119078	10/11/12	SEABOSS
SB-05-1	SB-05-1-3	IMG_3303.JPG	41.11338	-73.11894	10/11/12	SEABOSS
SB-05-1	SB-05-1-4	IMG_3305.JPG	41.113393	-73.118478	10/11/12	SEABOSS
SB-05-1	SB-05-1-5	IMG_3306.JPG	41.113405	-73.118372	10/11/12	SEABOSS
SB-05-1	SB-05-1-6	IMG_3307.JPG	41.113415	-73.118282	10/11/12	SEABOSS
SB-05-1	SB-05-1-7	IMG_3308.JPG	41.113417	-73.118173	10/11/12	SEABOSS
SB-05-2	SB-05-2-1	IMG_3309.JPG	41.110687	-73.115227	10/11/12	SEABOSS
SB-05-2	SB-05-2-2	IMG_3310.JPG	41.110658	-73.115107	10/11/12	SEABOSS
SB-05-2	SB-05-2-3	IMG_3311.JPG	41.110638	-73.11503	10/11/12	SEABOSS
SB-05-2	SB-05-2-4	IMG_3312.JPG	41.11062	-73.114982	10/11/12	SEABOSS
SB-05-2	SB-05-2-5	IMG_3313.JPG	41.110587	-73.114888	10/11/12	SEABOSS
SB-05-2	SB-05-2-6	IMG_3314.JPG	41.110547	-73.114733	10/11/12	SEABOSS
SB-05-2	SB-05-2-7	IMG_3315.JPG	41.110537	-73.114705	10/11/12	SEABOSS
SB-05-2	SB-05-2-8	IMG_3316.JPG	41.110528	-73.114628	10/11/12	SEABOSS
SB-05-2	SB-05-2-9	IMG_3317.JPG	41.110532	-73.11459	10/11/12	SEABOSS
SB-05-3	SB-05-3-1	IMG_3319.JPG	41.113262	-73.121628	10/11/12	SEABOSS
SB-05-3	SB-05-3-2	IMG_3320.JPG	41.113252	-73.121443	10/11/12	SEABOSS
SB-05-3	SB-05-3-3	IMG_3321.JPG	41.113245	-73.121223	10/11/12	SEABOSS
SB-05-3	SB-05-3-4	IMG_3322.JPG	41.11316	-73.120925	10/11/12	SEABOSS
SB-05-3	SB-05-3-5	IMG_3323.JPG	41.113142	-73.120863	10/11/12	SEABOSS

SB-05-3	SB-05-3-6	IMG_3324.JPG	41.113095	-73.120707	10/11/12	SEABOSS
SB-05-3	SB-05-3-7	IMG_3325.JPG	41.113072	-73.120595	10/11/12	SEABOSS
SB-06-1	SB-06-1-1	IMG_3073.JPG	41.1118	-73.085217	10/10/12	SEABOSS
SB-06-1	SB-06-1-2	IMG_3074.JPG	41.1118	-73.085183	10/10/12	SEABOSS
SB-06-1	SB-06-1-3	IMG_3075.JPG	41.1118	-73.085083	10/10/12	SEABOSS
SB-06-1	SB-06-1-4	IMG_3078.JPG	41.111783	-73.084817	10/10/12	SEABOSS
SB-06-2	SB-06-2-1	IMG_3080.JPG	41.11605	-73.083783	10/10/12	SEABOSS
SB-06-2	SB-06-2-2	IMG_3081.JPG	41.116033	-73.08365	10/10/12	SEABOSS
SB-06-2	SB-06-2-3	IMG_3082.JPG	41.116017	-73.08355	10/10/12	SEABOSS
SB-06-2	SB-06-2-4	IMG_3083.JPG	41.116017	-73.0835	10/10/12	SEABOSS
SB-06-3	SB-06-3-1	IMG_3086.JPG	41.111183	-73.083283	10/10/12	SEABOSS
SB-06-3	SB-06-3-2	IMG_3087.JPG	41.111183	-73.08325	10/10/12	SEABOSS
SB-06-3	SB-06-3-3	IMG_3088.JPG	41.111183	-73.0832	10/10/12	SEABOSS
SB-06-3	SB-06-3-4	IMG_3089.JPG	41.1111167	-73.083083	10/10/12	SEABOSS
SB-06-3	SB-06-3-5	IMG_3090.JPG	41.11115	-73.083	10/10/12	SEABOSS
SB-06-4	SB-06-4-1	IMG_3091.JPG	41.1146	-73.082917	10/10/12	SEABOSS
SB-06-4	SB-06-4-2	IMG_3092.JPG	41.114583	-73.082867	10/10/12	SEABOSS
SB-06-4	SB-06-4-3	IMG_3096.JPG	41.11455	-73.08265	10/10/12	SEABOSS
SB-06-5	SB-06-5-1	IMG_3101.JPG	41.113417	-73.078433	10/10/12	SEABOSS
SB-06-5	SB-06-5-2	IMG_3103.JPG	41.113417	-73.078333	10/10/12	SEABOSS
SB-06-5	SB-06-5-3	IMG_3104.JPG	41.113433	-73.078267	10/10/12	SEABOSS
SB-06-6	SB-06-6-1	IMG_3105.JPG	41.112867	-73.082317	10/10/12	SEABOSS
SB-06-6	SB-06-6-2	IMG_3107.JPG	41.11285	-73.082217	10/10/12	SEABOSS
SB-06-6	SB-06-6-3	IMG_3108.JPG	41.11285	-73.0822	10/10/12	SEABOSS
SB-06-6	SB-06-6-4	IMG_3109.JPG	41.112817	-73.082133	10/10/12	SEABOSS
SB-07-1	SB-07-1-1	IMG_3412.JPG	41.094923	-73.12827	10/11/12	SEABOSS
SB-07-1	SB-07-1-2	IMG_3414.JPG	41.094863	-73.128095	10/11/12	SEABOSS
SB-07-1	SB-07-1-3	IMG_3416.JPG	41.094783	-73.127845	10/11/12	SEABOSS
SB-07-2	SB-07-2-1	IMG_3417.JPG	41.09228	-73.1297	10/11/12	SEABOSS
SB-07-2	SB-07-2-2	IMG_3419.JPG	41.092313	-73.129477	10/11/12	SEABOSS
SB-07-2	SB-07-2-3	IMG_3421.JPG	41.092322	-73.129153	10/11/12	SEABOSS
SB-07-2	SB-07-2-4	IMG_3422.JPG	41.0923	-73.128852	10/11/12	SEABOSS
SB-07-3	SB-07-3-1	IMG_3425.JPG	41.097565	-73.126397	10/11/12	SEABOSS
SB-07-3	SB-07-3-2	IMG_3426.JPG	41.097563	-73.126272	10/11/12	SEABOSS
SB-07-3	SB-07-3-3	IMG_3427.JPG	41.097563	-73.126165	10/11/12	SEABOSS
SB-07-3	SB-07-3-4	IMG_3428.JPG	41.09756	-73.126082	10/11/12	SEABOSS
SB-07-3	SB-07-3-5	IMG_3429.JPG	41.097562	-73.125938	10/11/12	SEABOSS
SB-08-2	SB-08-2-1	IMG_5000.JPG	41.08312	-73.100547	10/15/12	SEABOSS
SB-08-2	SB-08-2-2	IMG_5002.JPG	41.083258	-73.100615	10/15/12	SEABOSS
SB-08-2	SB-08-2-3	IMG_5003.JPG	41.083285	-73.100628	10/15/12	SEABOSS
SB-08-2	SB-08-2-4	IMG_5004.JPG	41.083337	-73.100653	10/15/12	SEABOSS
SB-08-2	SB-08-2-5	IMG_5005.JPG	41.083363	-73.100665	10/15/12	SEABOSS
SB-08-2	SB-08-2-6	IMG_5006.JPG	41.083435	-73.100697	10/15/12	SEABOSS
SB-08-3	SB-08-3-1	IMG_5009.JPG	41.088585	-73.099488	10/15/12	SEABOSS
SB-08-3	SB-08-3-2	IMG_5010.JPG	41.088622	-73.099503	10/15/12	SEABOSS

SB-08-3	SB-08-3-3	IMG_5011.JPG	41.088642	-73.099512	10/15/12	SEABOSS
SB-08-3	SB-08-3-4	IMG_5012.JPG	41.088702	-73.099537	10/15/12	SEABOSS
SB-08-3	SB-08-3-5	IMG_5013.JPG	41.088763	-73.099567	10/15/12	SEABOSS
SB-09-3	SB-09-3-1	IMG_5110.JPG	41.089345	-73.071157	10/15/12	SEABOSS
SB-09-4	SB-09-4-1	IMG_5116.JPG	41.088185	-73.074087	10/15/12	SEABOSS
SB-09-4	SB-09-4-2	IMG_5117.JPG	41.088185	-73.07408	10/15/12	SEABOSS
SB-09-4	SB-09-4-3	IMG_5119.JPG	41.08822	-73.074068	10/15/12	SEABOSS
SB-09-5	SB-09-5-1	IMG_5124.JPG	41.088138	-73.068542	10/15/12	SEABOSS
SB-09-5	SB-09-5-2	IMG_5125.JPG	41.08816	-73.068538	10/15/12	SEABOSS
SB-09-5	SB-09-5-3	IMG_5126.JPG	41.0882	-73.068535	10/15/12	SEABOSS
SB-09-5	SB-09-5-4	IMG_5128.JPG	41.088342	-73.068523	10/15/12	SEABOSS
SB-10-1	SB-10-1-1	IMG_3525.JPG	41.081483	-73.1352	10/11/12	SEABOSS
SB-10-1	SB-10-1-2	IMG_3526.JPG	41.081467	-73.135133	10/11/12	SEABOSS
SB-10-1	SB-10-1-3	IMG_3527.JPG	41.081467	-73.135083	10/11/12	SEABOSS
SB-10-1	SB-10-1-4	IMG_3528.JPG	41.081467	-73.135017	10/11/12	SEABOSS
SB-10-1	SB-10-1-5	IMG_3529.JPG	41.081467	-73.135017	10/11/12	SEABOSS
SB-10-2	SB-10-2-1	IMG_3530.JPG	41.081767	-73.133167	10/11/12	SEABOSS
SB-10-2	SB-10-2-2	IMG_3531.JPG	41.081767	-73.1331	10/11/12	SEABOSS
SB-10-2	SB-10-2-3	IMG_3532.JPG	41.081767	-73.13305	10/11/12	SEABOSS
SB-10-2	SB-10-2-4	IMG_3533.JPG	41.081767	-73.133	10/11/12	SEABOSS
SB-10-2	SB-10-2-5	IMG_3534.JPG	41.081767	-73.132933	10/11/12	SEABOSS
SB-10-2	SB-10-2-6	IMG_3535.JPG	41.081767	-73.132883	10/11/12	SEABOSS
SB-10-3	SB-10-3-1	IMG_3537.JPG	41.074567	-73.1311	10/11/12	SEABOSS
SB-10-3	SB-10-3-2	IMG_3538.JPG	41.074567	-73.131067	10/11/12	SEABOSS
SB-10-3	SB-10-3-3	IMG_3539.JPG	41.074567	-73.131017	10/11/12	SEABOSS
SB-10-3	SB-10-3-4	IMG_3540.JPG	41.074567	-73.130933	10/11/12	SEABOSS
SB-10-3	SB-10-3-5	IMG_3541.JPG	41.074567	-73.130867	10/11/12	SEABOSS
SB-10-3	SB-10-3-6	IMG_3542.JPG	41.074567	-73.13085	10/11/12	SEABOSS
SB-11-1	SB-11-1-1	IMG_4517.JPG	41.070962	-73.106893	10/13/12	SEABOSS
SB-11-1	SB-11-1-2	IMG_4518.JPG	41.070953	-73.10688	10/13/12	SEABOSS
SB-11-1	SB-11-1-3	IMG_4519.JPG	41.070947	-73.106855	10/13/12	SEABOSS
SB-11-1	SB-11-1-4	IMG_4520.JPG	41.070943	-73.106837	10/13/12	SEABOSS
SB-11-1	SB-11-1-5	IMG_4521.JPG	41.070942	-73.106822	10/13/12	SEABOSS
SB-11-1	SB-11-1-6	IMG_4522.JPG	41.070942	-73.106805	10/13/12	SEABOSS
SB-11-2	SB-11-2-1	IMG_4526.JPG	41.075272	-73.11481	10/13/12	SEABOSS
SB-11-2	SB-11-2-2	IMG_4528.JPG	41.075318	-73.114867	10/13/12	SEABOSS
SB-11-2	SB-11-2-3	IMG_4529.JPG	41.075338	-73.11489	10/13/12	SEABOSS
SB-11-3	SB-11-3-1	IMG_4534.JPG	41.075408	-73.108702	10/13/12	SEABOSS
SB-11-3	SB-11-3-2	IMG_4535.JPG	41.07539	-73.108655	10/13/12	SEABOSS
SB-11-3	SB-11-3-3	IMG_4536.JPG	41.075383	-73.108633	10/13/12	SEABOSS
SB-11-3	SB-11-3-4	IMG_4537.JPG	41.075377	-73.10862	10/13/12	SEABOSS
SB-11-3	SB-11-3-5	IMG_4538.JPG	41.075363	-73.10859	10/13/12	SEABOSS
SB-11-3	SB-11-3-6	IMG_4539.JPG	41.075353	-73.108568	10/13/12	SEABOSS
SB-11-3	SB-11-3-7	IMG_4540.JPG	41.075345	-73.108547	10/13/12	SEABOSS
SB-12-1	SB-12-1-1	IMG_5250.JPG	41.070405	-73.073818	10/15/12	SEABOSS

SB-12-1	SB-12-1-2	IMG_5251.JPG	41.070418	-73.073817	10/15/12	SEABOSS
SB-12-1	SB-12-1-3	IMG_5252.JPG	41.070435	-73.073812	10/15/12	SEABOSS
SB-12-1	SB-12-1-4	IMG_5256.JPG	41.070673	-73.073645	10/15/12	SEABOSS
SB-12-2	SB-12-2-1	IMG_5257.JPG	41.071618	-73.076838	10/15/12	SEABOSS
SB-12-2	SB-12-2-2	IMG_5259.JPG	41.07167	-73.076793	10/15/12	SEABOSS
SB-12-2	SB-12-2-3	IMG_5260.JPG	41.07175	-73.076725	10/15/12	SEABOSS
SB-12-2	SB-12-2-4	IMG_5261.JPG	41.071765	-73.076713	10/15/12	SEABOSS
SB-12-2	SB-12-2-5	IMG_5262.JPG	41.071808	-73.076682	10/15/12	SEABOSS
SB-12-2	SB-12-2-6	IMG_5263.JPG	41.071833	-73.076657	10/15/12	SEABOSS
SB-12-3	SB-12-3-1	IMG_5265.JPG	41.076153	-73.07757	10/15/12	SEABOSS
SB-12-3	SB-12-3-2	IMG_5266.JPG	41.076155	-73.077562	10/15/12	SEABOSS
SB-12-3	SB-12-3-3	IMG_5267.JPG	41.076163	-73.077533	10/15/12	SEABOSS
SB-12-3	SB-12-3-4	IMG_5268.JPG	41.076175	-73.077503	10/15/12	SEABOSS
SB-12-3	SB-12-3-5	IMG_5269.JPG	41.07624	-73.077368	10/15/12	SEABOSS
SB-12-3	SB-12-3-6	IMG_5270.JPG	41.076362	-73.07709	10/15/12	SEABOSS
SB-12-3	SB-12-3-7	IMG_5271.JPG	41.076395	-73.07701	10/15/12	SEABOSS
SB-12-3	SB-12-3-8	IMG_5273.JPG	41.07649	-73.076702	10/15/12	SEABOSS
SB-12-3	SB-12-3-9	IMG_5274.JPG	41.076533	-73.07655	10/15/12	SEABOSS
SB-12-3	SB-12-3-10	IMG_5276.JPG	41.07657	-73.076442	10/15/12	SEABOSS
SB-12-4	SB-12-4-1	IMG_5279.JPG	41.073363	-73.071878	10/15/12	SEABOSS
SB-12-4	SB-12-4-2	IMG_5283.JPG	41.073515	-73.071598	10/15/12	SEABOSS
SB-12-4	SB-12-4-3	IMG_5284.JPG	41.07352	-73.07159	10/15/12	SEABOSS
SB-12-4	SB-12-4-4	IMG_5285.JPG	41.073545	-73.071542	10/15/12	SEABOSS
SB-12-4	SB-12-4-5	IMG_5286.JPG	41.073602	-73.071437	10/15/12	SEABOSS
SB-12-5	SB-12-5-1	IMG_5288.JPG	41.06835	-73.073398	10/15/12	SEABOSS
SB-12-5	SB-12-5-2	IMG_5289.JPG	41.06838	-73.073398	10/15/12	SEABOSS
SB-12-5	SB-12-5-3	IMG_5290.JPG	41.068393	-73.073307	10/15/12	SEABOSS
SB-12-5	SB-12-5-4	IMG_5291.JPG	41.06842	-73.073255	10/15/12	SEABOSS
SB-12-5	SB-12-5-5	IMG_5292.JPG	41.068437	-73.073223	10/15/12	SEABOSS
SB-12-5	SB-12-5-6	IMG_5294.JPG	41.06848	-73.073132	10/15/12	SEABOSS
SB-12-6	SB-12-6-1	IMG_5295.JPG	41.069272	-73.077695	10/15/12	SEABOSS
SB-12-6	SB-12-6-2	IMG_5296.JPG	41.069312	-73.077623	10/15/12	SEABOSS
SB-12-6	SB-12-6-3	IMG_5297.JPG	41.069427	-73.077422	10/15/12	SEABOSS
SB-12-6	SB-12-6-4	IMG_5298.JPG	41.06951	-73.077283	10/15/12	SEABOSS
SB-12-6	SB-12-6-5	IMG_5299.JPG	41.069563	-73.077185	10/15/12	SEABOSS
SB-12-6	SB-12-6-6	IMG_5300.JPG	41.069607	-73.077108	10/15/12	SEABOSS
SB-12-7	SB-12-7-1	IMG_5302.JPG	41.075598	-73.07822	10/15/12	SEABOSS
SB-12-7	SB-12-7-2	IMG_5303.JPG	41.075645	-73.07812	10/15/12	SEABOSS
SB-12-7	SB-12-7-3	IMG_5304.JPG	41.075693	-73.078027	10/15/12	SEABOSS
SB-12-7	SB-12-7-4	IMG_5305.JPG	41.075748	-73.077917	10/15/12	SEABOSS
SB-12-7	SB-12-7-5	IMG_5306.JPG	41.075795	-73.07782	10/15/12	SEABOSS
SB-12-7	SB-12-7-6	IMG_5307.JPG	41.07583	-73.077753	10/15/12	SEABOSS
SB-12-7	SB-12-7-7	IMG_5308.JPG	41.075938	-73.077533	10/15/12	SEABOSS
SB-12-7	SB-12-7-8	IMG_5309.JPG	41.076063	-73.077275	10/15/12	SEABOSS
SB-12-7	SB-12-7-9	IMG_5310.JPG	41.076088	-73.077218	10/15/12	SEABOSS

SB-12-7	SB-12-7-10	IMG_5311.JPG	41.076148	-73.077088	10/15/12	SEABOSS
SB-12-8	SB-12-8-1	IMG_5316.JPG	41.071217	-73.07894	10/15/12	SEABOSS
SB-12-8	SB-12-8-2	IMG_5319.JPG	41.071382	-73.07847	10/15/12	SEABOSS
SB-12-8	SB-12-8-3	IMG_5320.JPG	41.071483	-73.078202	10/15/12	SEABOSS
SB-12-8	SB-12-8-4	IMG_5321.JPG	41.071505	-73.078143	10/15/12	SEABOSS
SB-12-8	SB-12-8-5	IMG_5322.JPG	41.071543	-73.078053	10/15/12	SEABOSS
SB-12-8	SB-12-8-6	IMG_5323.JPG	41.071587	-73.077935	10/15/12	SEABOSS
SB-12-9	SB-12-9-1	IMG_5325.JPG	41.0743	-73.075237	10/15/12	SEABOSS
SB-12-9	SB-12-9-2	IMG_5326.JPG	41.074378	-73.07503	10/15/12	SEABOSS
SB-12-9	SB-12-9-3	IMG_5327.JPG	41.074417	-73.074927	10/15/12	SEABOSS
SB-12-9	SB-12-9-4	IMG_5328.JPG	41.074455	-73.074833	10/15/12	SEABOSS
SB-12-9	SB-12-9-5	IMG_5329.JPG	41.074487	-73.074773	10/15/12	SEABOSS
SB-12-9	SB-12-9-6	IMG_5330.JPG	41.074538	-73.074672	10/15/12	SEABOSS
SB-12-9	SB-12-9-7	IMG_5331.JPG	41.074577	-73.07458	10/15/12	SEABOSS
SB-13-1	SB-13-1-1	IMG_3944.JPG	41.064053	-73.139318	10/12/12	SEABOSS
SB-13-1	SB-13-1-2	IMG_3945.JPG	41.063962	-73.139302	10/12/12	SEABOSS
SB-13-1	SB-13-1-3	IMG_3946.JPG	41.063888	-73.139288	10/12/12	SEABOSS
SB-13-1	SB-13-1-4	IMG_3947.JPG	41.063833	-73.139275	10/12/12	SEABOSS
SB-13-2	SB-13-2-1	IMG_3949.JPG	41.0691	-73.14253	10/12/12	SEABOSS
SB-13-2	SB-13-2-2	IMG_3950.JPG	41.069072	-73.142518	10/12/12	SEABOSS
SB-13-2	SB-13-2-3	IMG_3951.JPG	41.06904	-73.142505	10/12/12	SEABOSS
SB-13-2	SB-13-2-4	IMG_3952.JPG	41.06902	-73.142498	10/12/12	SEABOSS
SB-13-3	SB-13-3-1	IMG_3956.JPG	41.06621	-73.140515	10/12/12	SEABOSS
SB-13-3	SB-13-3-2	IMG_3958.JPG	41.066103	-73.140528	10/12/12	SEABOSS
SB-13-3	SB-13-3-3	IMG_3959.JPG	41.065908	-73.140567	10/12/12	SEABOSS
SB-13-3	SB-13-3-4	IMG_3960.JPG	41.065753	-73.140598	10/12/12	SEABOSS
SB-14-1	SB-14-1-1	IMG_5421.JPG	41.059498	-73.048857	10/15/12	SEABOSS
SB-14-1	SB-14-1-2	IMG_5423.JPG	41.059607	-73.048685	10/15/12	SEABOSS
SB-14-1	SB-14-1-3	IMG_5424.JPG	41.059732	-73.048488	10/15/12	SEABOSS
SB-14-1	SB-14-1-4	IMG_5425.JPG	41.059833	-73.048313	10/15/12	SEABOSS
SB-14-2	SB-14-2-1	IMG_5428.JPG	41.064715	-73.046617	10/15/12	SEABOSS
SB-14-2	SB-14-2-2	IMG_5429.JPG	41.064752	-73.04657	10/15/12	SEABOSS
SB-14-2	SB-14-2-3	IMG_5430.JPG	41.064832	-73.046458	10/15/12	SEABOSS
SB-14-2	SB-14-2-4	IMG_5432.JPG	41.065038	-73.046138	10/15/12	SEABOSS
SB-15-1	SB-15-1-1	IMG_6543.JPG	41.059092	-73.026333	10/17/12	SEABOSS
SB-15-1	SB-15-1-2	IMG_6545.JPG	41.059078	-73.026282	10/17/12	SEABOSS
SB-15-2	SB-15-2-1	IMG_6550.JPG	41.064097	-73.030732	10/17/12	SEABOSS
SB-15-2	SB-15-2-2	IMG_6552.JPG	41.063942	-73.030855	10/17/12	SEABOSS
SB-15-3	SB-15-3-1	IMG_6556.JPG	41.060878	-73.031675	10/17/12	SEABOSS
SB-15-3	SB-15-3-2	IMG_6558.JPG	41.060888	-73.031778	10/17/12	SEABOSS
SB-16-1	SB-16-1-1	IMG_6415.JPG	41.047727	-73.135652	10/17/12	SEABOSS
SB-16-1	SB-16-1-2	IMG_6416.JPG	41.047667	-73.135658	10/17/12	SEABOSS
SB-16-1	SB-16-1-3	IMG_6417.JPG	41.04764	-73.135673	10/17/12	SEABOSS
SB-16-1	SB-16-1-4	IMG_6418.JPG	41.047638	-73.135688	10/17/12	SEABOSS
SB-16-1	SB-16-1-5	IMG_6419.JPG	41.047603	-73.13569	10/17/12	SEABOSS

SB-16-1	SB-16-1-6	IMG_6420.JPG	41.047588	-73.135748	10/17/12 SEABOSS
SB-16-2	SB-16-2-1	IMG_6422.JPG	41.047643	-73.132642	10/17/12 SEABOSS
SB-16-2	SB-16-2-2	IMG_6424.JPG	41.047632	-73.13262	10/17/12 SEABOSS
SB-16-2	SB-16-2-3	IMG_6425.JPG	41.04762	-73.132617	10/17/12 SEABOSS
SB-16-3	SB-16-3-1	IMG_6429.JPG	41.051588	-73.138037	10/17/12 SEABOSS
SB-16-3	SB-16-3-2	IMG_6430.JPG	41.051593	-73.138052	10/17/12 SEABOSS
SB-17-1	SB-17-1-1	IMG_4409.JPG	41.046318	-73.122792	10/13/12 SEABOSS
SB-17-1	SB-17-1-2	IMG_4410.JPG	41.046313	-73.122748	10/13/12 SEABOSS
SB-17-1	SB-17-1-3	IMG_4411.JPG	41.046295	-73.122652	10/13/12 SEABOSS
SB-17-1	SB-17-1-4	IMG_4412.JPG	41.046272	-73.122518	10/13/12 SEABOSS
SB-17-1	SB-17-1-5	IMG_4413.JPG	41.046252	-73.122437	10/13/12 SEABOSS
SB-17-1	SB-17-1-6	IMG_4414.JPG	41.046235	-73.122368	10/13/12 SEABOSS
SB-17-2	SB-17-2-1	IMG_4417.JPG	41.049123	-73.11893	10/13/12 SEABOSS
SB-17-2	SB-17-2-2	IMG_4418.JPG	41.049105	-73.11891	10/13/12 SEABOSS
SB-17-2	SB-17-2-3	IMG_4419.JPG	41.049062	-73.118825	10/13/12 SEABOSS
SB-17-2	SB-17-2-4	IMG_4420.JPG	41.049027	-73.11877	10/13/12 SEABOSS
SB-17-3	SB-17-3-1	IMG_4423.JPG	41.04617	-73.121173	10/13/12 SEABOSS
SB-17-3	SB-17-3-2	IMG_4424.JPG	41.046162	-73.121168	10/13/12 SEABOSS
SB-17-3	SB-17-3-3	IMG_4425.JPG	41.046127	-73.12114	10/13/12 SEABOSS
SB-17-3	SB-17-3-4	IMG_4426.JPG	41.046103	-73.121118	10/13/12 SEABOSS
SB-17-3	SB-17-3-5	IMG_4427.JPG	41.046073	-73.121082	10/13/12 SEABOSS
SB-17-3	SB-17-3-6	IMG_4428.JPG	41.046047	-73.121042	10/13/12 SEABOSS
SB-17-3	SB-17-3-7	IMG_4429.JPG	41.045982	-73.120925	10/13/12 SEABOSS
SB-18-1	SB-18-1-1	IMG_4173.JPG	41.046505	-73.10025	10/13/12 SEABOSS
SB-18-1	SB-18-1-2	IMG_4174.JPG	41.046472	-73.100152	10/13/12 SEABOSS
SB-18-1	SB-18-1-3	IMG_4175.JPG	41.046462	-73.100125	10/13/12 SEABOSS
SB-18-1	SB-18-1-4	IMG_4176.JPG	41.046437	-73.100063	10/13/12 SEABOSS
SB-18-1	SB-18-1-5	IMG_4177.JPG	41.046427	-73.100043	10/13/12 SEABOSS
SB-18-1	SB-18-1-6	IMG_4178.JPG	41.046418	-73.100028	10/13/12 SEABOSS
SB-18-2	SB-18-2-1	IMG_4180.JPG	41.051392	-73.096477	10/13/12 SEABOSS
SB-18-2	SB-18-2-2	IMG_4181.JPG	41.05139	-73.09645	10/13/12 SEABOSS
SB-18-2	SB-18-2-3	IMG_4182.JPG	41.051383	-73.096373	10/13/12 SEABOSS
SB-18-2	SB-18-2-4	IMG_4183.JPG	41.051378	-73.096335	10/13/12 SEABOSS
SB-18-2	SB-18-2-5	IMG_4184.JPG	41.051373	-73.096307	10/13/12 SEABOSS
SB-18-2	SB-18-2-6	IMG_4185.JPG	41.051362	-73.096255	10/13/12 SEABOSS
SB-18-2	SB-18-2-7	IMG_4186.JPG	41.051308	-73.096073	10/13/12 SEABOSS
SB-18-3	SB-18-3-1	IMG_4189.JPG	41.049908	-73.102042	10/13/12 SEABOSS
SB-18-3	SB-18-3-2	IMG_4190.JPG	41.049918	-73.102035	10/13/12 SEABOSS
SB-18-3	SB-18-3-3	IMG_4191.JPG	41.049953	-73.10201	10/13/12 SEABOSS
SB-18-3	SB-18-3-4	IMG_4192.JPG	41.04996	-73.102002	10/13/12 SEABOSS
SB-18-3	SB-18-3-5	IMG_4193.JPG	41.049992	-73.101965	10/13/12 SEABOSS
SB-18-3	SB-18-3-6	IMG_4194.JPG	41.050003	-73.101952	10/13/12 SEABOSS
SB-19-1	SB-19-1-1	IMG_4036.JPG	41.042985	-73.078253	10/13/12 SEABOSS
SB-19-1	SB-19-1-2	IMG_4037.JPG	41.042982	-73.078233	10/13/12 SEABOSS
SB-19-1	SB-19-1-3	IMG_4038.JPG	41.042965	-73.078202	10/13/12 SEABOSS

SB-19-1	SB-19-1-4	IMG_4040.JPG	41.042953	-73.078188	10/13/12	SEABOSS
SB-19-1	SB-19-1-5	IMG_4041.JPG	41.042945	-73.078182	10/13/12	SEABOSS
SB-19-2	SB-19-2-1	IMG_4043.JPG	41.04664	-73.079553	10/13/12	SEABOSS
SB-19-2	SB-19-2-2	IMG_4044.JPG	41.046612	-73.079597	10/13/12	SEABOSS
SB-19-2	SB-19-2-3	IMG_4045.JPG	41.0466	-73.079613	10/13/12	SEABOSS
SB-19-2	SB-19-2-4	IMG_4046.JPG	41.04658	-73.079642	10/13/12	SEABOSS
SB-19-2	SB-19-2-5	IMG_4047.JPG	41.046568	-73.07966	10/13/12	SEABOSS
SB-19-2	SB-19-2-6	IMG_4048.JPG	41.046548	-73.079685	10/13/12	SEABOSS
SB-19-4	SB-19-4-1	IMG_4050.JPG	41.04908	-73.082618	10/13/12	SEABOSS
SB-19-4	SB-19-4-2	IMG_4051.JPG	41.049078	-73.082628	10/13/12	SEABOSS
SB-19-4	SB-19-4-3	IMG_4052.JPG	41.049077	-73.082638	10/13/12	SEABOSS
SB-19-4	SB-19-4-4	IMG_4053.JPG	41.049075	-73.082652	10/13/12	SEABOSS
SB-19-4	SB-19-4-5	IMG_4054.JPG	41.049072	-73.08266	10/13/12	SEABOSS
SB-19-4	SB-19-4-6	IMG_4055.JPG	41.049067	-73.082685	10/13/12	SEABOSS
SB-19-4	SB-19-4-7	IMG_4056.JPG	41.04906	-73.0827	10/13/12	SEABOSS
SB-20-1	SB-20-1-1	IMG_6152.JPG	41.046288	-73.011475	10/16/12	SEABOSS
SB-20-1	SB-20-1-2	IMG_6154.JPG	41.046235	-73.011072	10/16/12	SEABOSS
SB-20-1	SB-20-1-3	IMG_6156.JPG	41.04608	-73.010293	10/16/12	SEABOSS
SB-20-1	SB-20-1-4	IMG_6158.JPG	41.046048	-73.010005	10/16/12	SEABOSS
SB-20-2	SB-20-2-1	IMG_6160.JPG	41.046455	-73.015502	10/16/12	SEABOSS
SB-20-3	SB-20-3-1	IMG_6164.JPG	41.04603	-73.01983	10/16/12	SEABOSS
SB-20-3	SB-20-3-2	IMG_6165.JPG	41.045957	-73.019592	10/16/12	SEABOSS
SB-20-3	SB-20-3-3	IMG_6168.JPG	41.045782	-73.019098	10/16/12	SEABOSS
SB-20-3	SB-20-3-4	IMG_6169.JPG	41.045722	-73.018905	10/16/12	SEABOSS
SB-21-1	SB-21-1-1	IMG_4326.JPG	41.035417	-73.107047	10/13/12	SEABOSS
SB-21-1	SB-21-1-2	IMG_4327.JPG	41.03538	-73.107025	10/13/12	SEABOSS
SB-21-1	SB-21-1-3	IMG_4328.JPG	41.03534	-73.106993	10/13/12	SEABOSS
SB-21-1	SB-21-1-4	IMG_4329.JPG	41.03526	-73.106993	10/13/12	SEABOSS
SB-21-1	SB-21-1-5	IMG_4330.JPG	41.03498	-73.106665	10/13/12	SEABOSS
SB-21-1	SB-21-1-6	IMG_4331.JPG	41.034913	-73.10654	10/13/12	SEABOSS
SB-21-2	SB-21-2-1	IMG_4333.JPG	41.041308	-73.111447	10/13/12	SEABOSS
SB-21-2	SB-21-2-2	IMG_4334.JPG	41.041362	-73.111422	10/13/12	SEABOSS
SB-21-2	SB-21-2-3	IMG_4335.JPG	41.041428	-73.111377	10/13/12	SEABOSS
SB-21-2	SB-21-2-4	IMG_4336.JPG	41.04148	-73.111325	10/13/12	SEABOSS
SB-21-2	SB-21-2-5	IMG_4337.JPG	41.04152	-73.111275	10/13/12	SEABOSS
SB-21-2	SB-21-2-6	IMG_4338.JPG	41.041565	-73.111213	10/13/12	SEABOSS
SB-21-3	SB-21-3-1	IMG_4340.JPG	41.039578	-73.1048	10/13/12	SEABOSS
SB-21-3	SB-21-3-2	IMG_4341.JPG	41.039567	-73.104728	10/13/12	SEABOSS
SB-21-3	SB-21-3-3	IMG_4342.JPG	41.039543	-73.104633	10/13/12	SEABOSS
SB-21-3	SB-21-3-4	IMG_4343.JPG	41.039498	-73.10445	10/13/12	SEABOSS
SB-21-3	SB-21-3-5	IMG_4344.JPG	41.039477	-73.10436	10/13/12	SEABOSS
SB-21-3	SB-21-3-6	IMG_4345.JPG	41.03946	-73.104288	10/13/12	SEABOSS
SB-22-1	SB-22-1-1	IMG_5447.JPG	41.032818	-73.058137	10/15/12	SEABOSS
SB-22-1	SB-22-1-2	IMG_5448.JPG	41.032885	-73.05802	10/15/12	SEABOSS
SB-22-1	SB-22-1-3	IMG_5450.JPG	41.032968	-73.057883	10/15/12	SEABOSS

SB-22-1	SB-22-1-4	IMG_5451.JPG	41.033012	-73.057815	10/15/12	SEABOSS
SB-22-2	SB-22-2-1	IMG_5455.JPG	41.029007	-73.061258	10/15/12	SEABOSS
SB-22-2	SB-22-2-2	IMG_5457.JPG	41.029072	-73.06122	10/15/12	SEABOSS
SB-22-2	SB-22-2-3	IMG_5458.JPG	41.029087	-73.061208	10/15/12	SEABOSS
SB-22-2	SB-22-2-4	IMG_5459.JPG	41.029147	-73.061152	10/15/12	SEABOSS
SB-22-2	SB-22-2-5	IMG_5460.JPG	41.02918	-73.061118	10/15/12	SEABOSS
SB-22-2	SB-22-2-6	IMG_5461.JPG	41.029295	-73.060992	10/15/12	SEABOSS
SB-22-3	SB-22-3-1	IMG_5463.JPG	41.030005	-73.05523	10/15/12	SEABOSS
SB-22-3	SB-22-3-2	IMG_5464.JPG	41.030027	-73.055218	10/15/12	SEABOSS
SB-22-3	SB-22-3-3	IMG_5465.JPG	41.030055	-73.0552	10/15/12	SEABOSS
SB-22-3	SB-22-3-4	IMG_5466.JPG	41.03007	-73.055188	10/15/12	SEABOSS
SB-22-3	SB-22-3-5	IMG_5467.JPG	41.030108	-73.055157	10/15/12	SEABOSS
SB-22-3	SB-22-3-6	IMG_5468.JPG	41.030147	-73.055122	10/15/12	SEABOSS
SB-22-3	SB-22-3-7	IMG_5469.JPG	41.03018	-73.055088	10/15/12	SEABOSS
SB-23-1	SB-23-1-1	IMG_5861.JPG	41.039872	-73.029473	10/16/12	SEABOSS
SB-23-1	SB-23-1-2	IMG_5863.JPG	41.039662	-73.029532	10/16/12	SEABOSS
SB-23-1	SB-23-1-3	IMG_5864.JPG	41.039642	-73.029533	10/16/12	SEABOSS
SB-23-1	SB-23-1-4	IMG_5865.JPG	41.039567	-73.029548	10/16/12	SEABOSS
SB-23-1	SB-23-1-5	IMG_5866.JPG	41.03951	-73.029558	10/16/12	SEABOSS
SB-23-2	SB-23-2-1	IMG_5868.JPG	41.033453	-73.029805	10/16/12	SEABOSS
SB-23-2	SB-23-2-2	IMG_5869.JPG	41.033223	-73.029867	10/16/12	SEABOSS
SB-23-2	SB-23-2-3	IMG_5872.JPG	41.032832	-73.029962	10/16/12	SEABOSS
SB-23-3	SB-23-3-1	IMG_5875.JPG	41.036802	-73.026783	10/16/12	SEABOSS
SB-23-3	SB-23-3-2	IMG_5877.JPG	41.03665	-73.02681	10/16/12	SEABOSS
SB-23-3	SB-23-3-3	IMG_5879.JPG	41.036445	-73.026855	10/16/12	SEABOSS
SB-23-3	SB-23-3-4	IMG_5880.JPG	41.036345	-73.026868	10/16/12	SEABOSS
SB-24-1	SB-24-1-1	IMG_6082.JPG	41.033365	-72.981222	10/16/12	SEABOSS
SB-24-1	SB-24-1-2	IMG_6083.JPG	41.033253	-72.980967	10/16/12	SEABOSS
SB-24-1	SB-24-1-3	IMG_6084.JPG	41.033218	-72.980897	10/16/12	SEABOSS
SB-24-1	SB-24-1-4	IMG_6086.JPG	41.033082	-72.980613	10/16/12	SEABOSS
SB-24-1	SB-24-1-5	IMG_6088.JPG	41.032998	-72.980398	10/16/12	SEABOSS
SB-24-2	SB-24-2-1	IMG_6090.JPG	41.03816	-72.985853	10/16/12	SEABOSS
SB-24-2	SB-24-2-2	IMG_6091.JPG	41.038078	-72.98565	10/16/12	SEABOSS
SB-24-2	SB-24-2-3	IMG_6093.JPG	41.037963	-72.98529	10/16/12	SEABOSS
SB-24-2	SB-24-2-4	IMG_6094.JPG	41.037898	-72.985063	10/16/12	SEABOSS
SB-24-2	SB-24-2-5	IMG_6095.JPG	41.037877	-72.985007	10/16/12	SEABOSS
SB-24-3	SB-24-3-1	IMG_6097.JPG	41.035068	-72.985518	10/16/12	SEABOSS
SB-24-3	SB-24-3-2	IMG_6098.JPG	41.035022	-72.9854	10/16/12	SEABOSS
SB-24-3	SB-24-3-3	IMG_6099.JPG	41.03493	-72.985218	10/16/12	SEABOSS
SB-24-3	SB-24-3-4	IMG_6101.JPG	41.034813	-72.984993	10/16/12	SEABOSS
SB-24-3	SB-24-3-6	IMG_6102.JPG	41.034767	-72.98491	10/16/12	SEABOSS
SB-25-1	SB-25-1-1	IMG_3544.JPG	41.029463	-73.113718	10/12/12	SEABOSS
SB-25-1	SB-25-1-2	IMG_3545.JPG	41.029512	-73.113643	10/12/12	SEABOSS
SB-25-1	SB-25-1-3	IMG_3546.JPG	41.029518	-73.11363	10/12/12	SEABOSS
SB-25-1	SB-25-1-4	IMG_3548.JPG	41.029527	-73.113615	10/12/12	SEABOSS

SB-25-1	SB-25-1-5	IMG_3549.JPG	41.029537	-73.113598	10/12/12	SEABOSS
SB-25-2	SB-25-2-1	IMG_3550.JPG	41.024117	-73.105862	10/12/12	SEABOSS
SB-25-2	SB-25-2-2	IMG_3551.JPG	41.024137	-73.105797	10/12/12	SEABOSS
SB-25-2	SB-25-2-3	IMG_3552.JPG	41.02414	-73.105787	10/12/12	SEABOSS
SB-25-2	SB-25-2-4	IMG_3553JPG	41.024142	-73.105773	10/12/12	SEABOSS
SB-25-2	SB-25-2-5	IMG_3554.JPG	41.024148	-73.105743	10/12/12	SEABOSS
SB-25-2	SB-25-2-6	IMG_3555.JPG	41.024153	-73.105705	10/12/12	SEABOSS
SB-25-2	SB-25-2-7	IMG_3556.JPG	41.024162	-73.105657	10/12/12	SEABOSS
SB-25-3	SB-25-3-1	IMG_3558.JPG	41.02521	-73.113905	10/12/12	SEABOSS
SB-25-3	SB-25-3-2	IMG_3559.JPG	41.025215	-73.113887	10/12/12	SEABOSS
SB-25-3	SB-25-3-3	IMG_3560.JPG	41.025227	-73.113843	10/12/12	SEABOSS
SB-25-3	SB-25-3-4	IMG_3561.JPG	41.025233	-73.113823	10/12/12	SEABOSS
SB-25-3	SB-25-3-5	IMG_3562.JPG	41.025242	-73.113797	10/12/12	SEABOSS
SB-25-3	SB-25-3-6	IMG_3563.JPG	41.025247	-73.113782	10/12/12	SEABOSS
SB-27-1	SB-27-1-1	IMG_6012.JPG	41.01812	-72.993015	10/16/12	SEABOSS
SB-27-1	SB-27-1-2	IMG_6013.JPG	41.018092	-72.992927	10/16/12	SEABOSS
SB-27-1	SB-27-1-3	IMG_6014.JPG	41.018063	-72.992827	10/16/12	SEABOSS
SB-27-1	SB-27-1-4	IMG_6015.JPG	41.018018	-72.992652	10/16/12	SEABOSS
SB-27-1	SB-27-1-5	IMG_6016.JPG	41.017992	-72.992567	10/16/12	SEABOSS
SB-27-1	SB-27-1-6	IMG_6017.JPG	41.017968	-72.99249	10/16/12	SEABOSS
SB-27-1	SB-27-1-7	IMG_6018.JPG	41.017927	-72.992398	10/16/12	SEABOSS
SB-27-2	SB-27-2-1	IMG_6021.JPG	41.022882	-72.993478	10/16/12	SEABOSS
SB-27-2	SB-27-2-2	IMG_6022.JPG	41.022853	-72.993403	10/16/12	SEABOSS
SB-27-2	SB-27-2-3	IMG_6023.JPG	41.022808	-72.9933	10/16/12	SEABOSS
SB-27-2	SB-27-2-4	IMG_6024.JPG	41.022733	-72.993138	10/16/12	SEABOSS
SB-27-2	SB-27-2-5	IMG_6025.JPG	41.0227	-72.993038	10/16/12	SEABOSS
SB-27-3	SB-27-3-1	IMG_6027.JPG	41.021008	-72.993157	10/16/12	SEABOSS
SB-27-3	SB-27-3-2	IMG_6028.JPG	41.02099	-72.993067	10/16/12	SEABOSS
SB-27-3	SB-27-3-3	IMG_6029.JPG	41.020958	-72.99285	10/16/12	SEABOSS
SB-27-3	SB-27-3-4	IMG_6030.JPG	41.020942	-72.992757	10/16/12	SEABOSS
SB-27-3	SB-27-3-5	IMG_6031.JPG	41.02091	-72.992617	10/16/12	SEABOSS
SB-27-3	SB-27-3-6	IMG_6032.JPG	41.020893	-72.992528	10/16/12	SEABOSS
SB-28-1	SB-28-1-1	IMG_3850.JPG	41.01083	-73.139872	10/12/12	SEABOSS
SB-28-1	SB-28-1-2	IMG_3851.JPG	41.010798	-73.139832	10/12/12	SEABOSS
SB-28-1	SB-28-1-3	IMG_3852.JPG	41.010787	-73.139815	10/12/12	SEABOSS
SB-28-1	SB-28-1-4	IMG_3853.JPG	41.01076	-73.139785	10/12/12	SEABOSS
SB-28-1	SB-28-1-5	IMG_3854.JPG	41.010727	-73.139742	10/12/12	SEABOSS
SB-28-1	SB-28-1-6	IMG_3855.JPG	41.010687	-73.139693	10/12/12	SEABOSS
SB-28-2	SB-28-2-1	IMG_3857.JPG	41.012003	-73.138793	10/12/12	SEABOSS
SB-28-2	SB-28-2-2	IMG_3858.JPG	41.011957	-73.138742	10/12/12	SEABOSS
SB-28-2	SB-28-2-3	IMG_3859.JPG	41.011862	-73.138643	10/12/12	SEABOSS
SB-28-2	SB-28-2-4	IMG_3860.JPG	41.011782	-73.138558	10/12/12	SEABOSS
SB-28-2	SB-28-2-5	IMG_3861.JPG	41.011758	-73.138537	10/12/12	SEABOSS
SB-28-3	SB-28-3-1	IMG_3864.JPG	41.014402	-73.145168	10/12/12	SEABOSS
SB-28-3	SB-28-3-2	IMG_3866.JPG	41.014328	-73.14512	10/12/12	SEABOSS

SB-28-3	SB-28-3-3	IMG_3867.JPG	41.014308	-73.145103	10/12/12	SEABOSS
SB-28-3	SB-28-3-4	IMG_3868.JPG	41.014268	-73.145077	10/12/12	SEABOSS
SB-29-1	SB-29-1-1	IMG_3674.JPG	41.010812	-73.11322	10/12/12	SEABOSS
SB-29-1	SB-29-1-2	IMG_3675.JPG	41.01075	-73.1129	10/12/12	SEABOSS
SB-29-1	SB-29-1-3	IMG_3677.JPG	41.010733	-73.112833	10/12/12	SEABOSS
SB-29-1	SB-29-1-4	IMG_3678.JPG	41.010718	-73.112788	10/12/12	SEABOSS
SB-29-1	SB-29-1-5	IMG_3680.JPG	41.010667	-73.112577	10/12/12	SEABOSS
SB-29-1	SB-29-1-6	IMG_3681.JPG	41.010647	-73.112512	10/12/12	SEABOSS
SB-29-1	SB-29-1-7	IMG_3682.JPG	41.010598	-73.11217	10/12/12	SEABOSS
SB-29-1	SB-29-1-8	IMG_3684.JPG	41.010543	-73.111887	10/12/12	SEABOSS
SB-29-1	SB-29-1-9	IMG_3685.JPG	41.010523	-73.111798	10/12/12	SEABOSS
SB-29-2	SB-29-2-1	IMG_3686.JPG	41.007535	-73.119497	10/12/12	SEABOSS
SB-29-2	SB-29-2-2	IMG_3687.JPG	41.007525	-73.119397	10/12/12	SEABOSS
SB-29-2	SB-29-2-3	IMG_3688.JPG	41.007518	-73.11926	10/12/12	SEABOSS
SB-29-2	SB-29-2-4	IMG_3689.JPG	41.007513	-73.11923	10/12/12	SEABOSS
SB-29-2	SB-29-2-5	IMG_3690.JPG	41.007488	-73.119102	10/12/12	SEABOSS
SB-29-3	SB-29-3-1	IMG_3693.JPG	41.01172	-73.116165	10/12/12	SEABOSS
SB-29-3	SB-29-3-2	IMG_3694.JPG	41.011695	-73.116122	10/12/12	SEABOSS
SB-29-3	SB-29-3-3	IMG_3695.JPG	41.011675	-73.11608	10/12/12	SEABOSS
SB-29-3	SB-29-3-4	IMG_3696.JPG	41.011635	-73.116008	10/12/12	SEABOSS
SB-29-3	SB-29-3-5	IMG_3697.JPG	41.011562	-73.115877	10/12/12	SEABOSS
SB-30-1	SB-30-1-1	IMG_6299.JPG	41.002975	-73.085345	10/17/12	SEABOSS
SB-30-1	SB-30-1-2	IMG_6300.JPG	41.002952	-73.08534	10/17/12	SEABOSS
SB-30-1	SB-30-1-3	IMG_6301.JPG	41.002917	-73.085327	10/17/12	SEABOSS
SB-30-1	SB-30-1-4	IMG_6302.JPG	41.002897	-73.085318	10/17/12	SEABOSS
SB-30-1	SB-30-1-5	IMG_6303.JPG	41.002857	-73.085298	10/17/12	SEABOSS
SB-30-1	SB-30-1-6	IMG_6304.JPG	41.002818	-73.085277	10/17/12	SEABOSS
SB-30-2	SB-30-2-1	IMG_6305.JPG	41.006733	-73.089485	10/17/12	SEABOSS
SB-30-2	SB-30-2-2	IMG_6306.JPG	41.006767	-73.08952	10/17/12	SEABOSS
SB-30-2	SB-30-2-3	IMG_6307.JPG	41.006793	-73.089565	10/17/12	SEABOSS
SB-30-2	SB-30-2-4	IMG_6308.JPG	41.0068	-73.089592	10/17/12	SEABOSS
SB-30-2	SB-30-2-5	IMG_6309.JPG	41.0068	-73.089622	10/17/12	SEABOSS
SB-30-3	SB-30-3-1	IMG_6311.JPG	41.009448	-73.091753	10/17/12	SEABOSS
SB-30-3	SB-30-3-2	IMG_6312.JPG	41.009468	-73.09179	10/17/12	SEABOSS
SB-30-3	SB-30-3-3	IMG_6313.JPG	41.00947	-73.091842	10/17/12	SEABOSS
SB-30-3	SB-30-3-4	IMG_6314.JPG	41.009465	-73.09187	10/17/12	SEABOSS
SB-30-3	SB-30-3-5	IMG_6315.JPG	41.009453	-73.091903	10/17/12	SEABOSS
SB-30-3	SB-30-3-6	IMG_6316.JPG	41.00944	-73.091923	10/17/12	SEABOSS
SB-31-1	SB-31-1-1	IMG_5912.JPG	41.007908	-73.024238	10/16/12	SEABOSS
SB-31-1	SB-31-1-2	IMG_5913.JPG	41.007795	-73.024205	10/16/12	SEABOSS
SB-31-1	SB-31-1-3	IMG_5914.JPG	41.007665	-73.024155	10/16/12	SEABOSS
SB-31-1	SB-31-1-4	IMG_5915.JPG	41.00755	-73.024133	10/16/12	SEABOSS
SB-31-2	SB-31-2-1	IMG_5919.JPG	41.012222	-73.021157	10/16/12	SEABOSS
SB-31-2	SB-31-2-2	IMG_5921.JPG	41.012108	-73.021112	10/16/12	SEABOSS
SB-31-2	SB-31-2-3	IMG_5922.JPG	41.011968	-73.021057	10/16/12	SEABOSS

SB-31-2	SB-31-2-4	IMG_5923.JPG	41.011863	-73.021015	10/16/12	SEABOSS
SB-31-2	SB-31-2-5	IMG_5924.JPG	41.011798	-73.020992	10/16/12	SEABOSS
SB-31-3	SB-31-3-1	IMG_5927.JPG	41.010365	-73.024367	10/16/12	SEABOSS
SB-31-3	SB-31-3-2	IMG_5928.JPG	41.010263	-73.024305	10/16/12	SEABOSS
SB-31-3	SB-31-3-3	IMG_5929.JPG	41.010112	-73.024248	10/16/12	SEABOSS
SB-32-1	SB-32-1-1	IMG_4684.JPG	41.014252	-72.975033	10/14/12	SEABOSS
SB-32-1	SB-32-1-2	IMG_4686.JPG	41.01435	-72.974973	10/14/12	SEABOSS
SB-32-1	SB-32-1-3	IMG_4687.JPG	41.014373	-72.974965	10/14/12	SEABOSS
SB-32-1	SB-32-1-4	IMG_4688.JPG	41.0144	-72.974962	10/14/12	SEABOSS
SB-32-2	SB-32-2-1	IMG_4690.JPG	41.019523	-72.976502	10/14/12	SEABOSS
SB-32-2	SB-32-2-2	IMG_4691.JPG	41.019575	-72.976468	10/14/12	SEABOSS
SB-32-2	SB-32-2-3	IMG_4693.JPG	41.019942	-72.976177	10/14/12	SEABOSS
SB-32-2	SB-32-2-4	IMG_4695.JPG	41.019955	-72.97617	10/14/12	SEABOSS
SB-32-2	SB-32-2-5	IMG_4696.JPG	41.019978	-72.976157	10/14/12	SEABOSS
SB-32-2	SB-32-2-6	IMG_4697.JPG	41.020055	-72.97604	10/14/12	SEABOSS
SB-32-2	SB-32-2-7	IMG_4698.JPG	41.020058	-72.976037	10/14/12	SEABOSS
SB-32-2	SB-32-2-8	IMG_4699.JPG	41.020067	-72.97603	10/14/12	SEABOSS
SB-32-2	SB-32-2-9	IMG_4700.JPG	41.02009	-72.976013	10/14/12	SEABOSS
SB-32-2	SB-32-2-10	IMG_4702.JPG	41.020183	-72.975965	10/14/12	SEABOSS
SB-32-3	SB-32-3-1	IMG_4704.JPG	41.016848	-72.979758	10/14/12	SEABOSS
SB-32-3	SB-32-3-2	IMG_4705.JPG	41.017063	-72.979657	10/14/12	SEABOSS
SB-32-3	SB-32-3-3	IMG_4706.JPG	41.017125	-72.979638	10/14/12	SEABOSS
SB-32-3	SB-32-3-4	IMG_4707.JPG	41.017147	-72.979638	10/14/12	SEABOSS
SB-32-3	SB-32-3-5	IMG_4708.JPG	41.017422	-72.979507	10/14/12	SEABOSS
SB-33-1	SB-33-1-1	IMG_3770.JPG	40.994525	-73.126078	10/12/12	SEABOSS
SB-33-1	SB-33-1-2	IMG_3771.JPG	40.994497	-73.12601	10/12/12	SEABOSS
SB-33-1	SB-33-1-3	IMG_3772.JPG	40.994453	-73.125905	10/12/12	SEABOSS
SB-33-1	SB-33-1-4	IMG_3773.JPG	40.994405	-73.125775	10/12/12	SEABOSS
SB-33-1	SB-33-1-5	IMG_3774.JPG	40.99432	-73.12551	10/12/12	SEABOSS
SB-33-1	SB-33-1-6	IMG_3775.JPG	40.99422	-73.125197	10/12/12	SEABOSS
SB-33-1	SB-33-1-7	IMG_3776.JPG	40.994203	-73.125142	10/12/12	SEABOSS
SB-33-1	SB-33-1-8	IMG_3777.JPG	40.994117	-73.124882	10/12/12	SEABOSS
SB-33-2	SB-33-2-1	IMG_3778.JPG	40.996908	-73.126008	10/12/12	SEABOSS
SB-33-2	SB-33-2-2	IMG_3779.JPG	40.996837	-73.125877	10/12/12	SEABOSS
SB-33-2	SB-33-2-3	IMG_3780.JPG	40.996778	-73.12576	10/12/12	SEABOSS
SB-33-2	SB-33-2-4	IMG_3781.JPG	40.996727	-73.125648	10/12/12	SEABOSS
SB-33-2	SB-33-2-5	IMG_3782.JPG	40.99664	-73.125463	10/12/12	SEABOSS
SB-33-2	SB-33-2-6	IMG_3783.JPG	40.996583	-73.125347	10/12/12	SEABOSS
SB-33-3	SB-33-3-1	IMG_3785.JPG	40.99733	-73.122507	10/12/12	SEABOSS
SB-33-3	SB-33-3-2	IMG_3786.JPG	40.997302	-73.122453	10/12/12	SEABOSS
SB-33-3	SB-33-3-3	IMG_3787.JPG	40.997268	-73.122395	10/12/12	SEABOSS
SB-33-3	SB-33-3-4	IMG_3788.JPG	40.997227	-73.122323	10/12/12	SEABOSS
SB-33-3	SB-33-3-5	IMG_3789.JPG	40.997193	-73.122267	10/12/12	SEABOSS
SB-33-3	SB-33-3-6	IMG_3790.JPG	40.997143	-73.122177	10/12/12	SEABOSS
SB-34-1	SB-34-1-1	IMG_4711.JPG	41.00019	-72.957685	10/14/12	SEABOSS

SB-34-1	SB-34-1-2	IMG_4715.JPG	41.000197	-72.956935	10/14/12	SEABOSS
SB-34-1	SB-34-1-3	IMG_4716.JPG	41.00023	-72.956553	10/14/12	SEABOSS
SB-34-1	SB-34-1-4	IMG_4717.JPG	41.000233	-72.956503	10/14/12	SEABOSS
SB-34-2	SB-34-2-1	IMG_4720.JPG	41.000952	-72.961167	10/14/12	SEABOSS
SB-34-2	SB-34-2-2	IMG_4721.JPG	41.000968	-72.961072	10/14/12	SEABOSS
SB-34-2	SB-34-2-3	IMG_4722.JPG	41.001005	-72.960768	10/14/12	SEABOSS
SB-34-2	SB-34-2-4	IMG_4724.JPG	41.001075	-72.960077	10/14/12	SEABOSS
SB-34-2	SB-34-2-5	IMG_4725.JPG	41.001087	-72.959943	10/14/12	SEABOSS
SB-34-3	SB-34-3-1	IMG_4727.JPG	41.001767	-72.96297	10/14/12	SEABOSS
SB-34-3	SB-34-3-2	IMG_4728.JPG	41.001788	-72.962805	10/14/12	SEABOSS
SB-34-3	SB-34-3-3	IMG_4729.JPG	41.001825	-72.96253	10/14/12	SEABOSS
SB-34-3	SB-34-3-4	IMG_4730.JPG	41.001855	-72.962312	10/14/12	SEABOSS
SB-34-3	SB-34-3-5	IMG_4731.JPG	41.001893	-72.9621	10/14/12	SEABOSS
SB-34-3	SB-34-3-6	IMG_4732.JPG	41.001917	-72.961948	10/14/12	SEABOSS

PROJECT	AREA	CONTACT	DATETIME
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:16:39:53
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:16:40:11
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:16:40:45
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:16:59:31
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:17:18:32
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:17:19:12
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:17:19:33
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:17:20:03
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:18:53
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:19:13
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:19:22
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:20:05
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:20:14
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:30:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:30:28
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:30:55
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:31:14
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:31:25
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:43:38
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:43:47
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:44:06
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:44:18
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:12:44:31
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:07:54
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:08:02
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:08:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:09:02
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:09:12
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:09:20
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:09:30
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:17:15
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:17:31
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:17:38
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:17:44
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:17:54
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:18:25
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:18:46
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:33:06
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:33:24
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:33:59
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:11:14:34:07

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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:19:11:07
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:19:12:08
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:19:29:14
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:19:29:48
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:10:19:30:34
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:17:53:31
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:17:53:50
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:17:54:05
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:17:57:42
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:18:07:33
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:18:07:40
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:18:07:53
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:18:08:12
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:18:08:41
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:13:18:09:09
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:12:44:59
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:12:45:41
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:12:45:58
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:12:46:21
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:12:46:41
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:12:56:38
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:12:57:22
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:12:58:39
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:13:10:12
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:13:10:54
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:13:11:46
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:13:12:13
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:04:24
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:05:02
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:05:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:05:53
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:06:22
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:19:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:19:46
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:20:32
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:20:58
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:21:05
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:34:27
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:34:44
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:35:11
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:35:45
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:18:36:00
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:35:55
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:36:10
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:36:26

LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:36:42
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:51:39
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:51:56
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:52:04
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:52:14
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:52:36
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:53:00
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:11:53:17
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:12:15:26
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:12:15:36
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:12:15:53
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:12:16:01
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:12:16:14
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:12:16:21
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:26:05
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:26:22
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:26:50
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:27:04
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:27:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:27:31
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:40:42
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:41:51
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:53:47
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:54:04
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:54:34
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:54:48
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:55:07
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:16:55:21
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:32:22
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:32:30
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:32:42
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:43:02
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:43:56
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:56:34
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:57:03

LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:57:13
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:18:57:27
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:07:38
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:08:22
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:08:41
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:08:48
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:09:13
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:09:26
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:10:13
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:10:51
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:11:02
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:26:55
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:27:11
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:27:38
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:27:43
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:28:01
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:41:08
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:41:25
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:41:38
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:41:54
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:14:42:14
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:10:55:41
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:10:55:58
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:10:56:20
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:10:56:31
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:10:56:55
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:10:57:17
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:08:23
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:08:50
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:09:21
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:09:42
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:10:05
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:20:33
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:21:53
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:22:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:22:42
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:17:11:22:59
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:04:18
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:04:47
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:17:25
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:17:59
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:18:21

LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:18:39
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:19:02
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:28:48
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:29:20
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:16:14:29:51
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:14:36:55
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:14:37:21
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:14:53:22
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:14:53:26
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:14:53:30
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:14:53:38
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:15:13:52
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:15:15:02
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:15:15:12
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:15:15:59
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:46:26
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:46:33
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LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:46:59
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:47:27
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:48:00
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:48:08
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:48:37
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:59:27
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:16:59:45
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:00:00
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:00:13
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:00:37
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:00:54
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:11:58
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:12:08
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:12:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:12:26
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:12:33
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:12:17:12:48
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:07:30

LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:08:50
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:09:38
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:09:43
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:30:50
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:30:56
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:31:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:32:06
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:32:16
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:45:26
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:45:38
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:45:58
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:46:14
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:46:30
LISMaRC PILOT	LONG ISLAND SOUND	LPOPPE	2012:10:14:16:46:41

2012 SEABOSS Video Log, October, 2012

STATION	LINELOC	LATITUDE	LONGITUDE	DATE	DEVICE
SB-03-1	SOL	41.13258333	-73.09028333	10/10/12	SEABOSS
SB-03-1	EOL	41.13253333	-73.09083333	10/10/12	SEABOSS
SB-03-2	SOL	41.13438333	-73.09065	10/10/12	SEABOSS
SB-03-2	EOL	41.1344	-73.09088333	10/10/12	SEABOSS
SB-03-3	SOL	41.13871667	-73.0863	10/10/12	SEABOSS
SB-03-3	EOL	41.13856667	-73.08655	10/10/12	SEABOSS
SB-04-1	SOL	41.12281667	-73.13826667	10/11/12	SEABOSS
SB-04-1	EOL	41.12271667	-73.1373	10/11/12	SEABOSS
SB-04-2	SOL	41.11978333	-73.13795	10/11/12	SEABOSS
SB-04-2	EOL	41.11963333	-73.13721667	10/11/12	SEABOSS
SB-04-3	SOL	41.12173333	-73.13455	10/11/12	SEABOSS
SB-04-3	EOL	41.12155	-73.13378333	10/11/12	SEABOSS
SB-05-1	SOL	41.1134	-73.11923333	10/11/12	SEABOSS
SB-05-1	EOL	41.11336667	-73.1179	10/11/12	SEABOSS
SB-05-2	SOL	41.11065	-73.11521667	10/11/12	SEABOSS
SB-05-2	EOL	41.11053333	-73.11433333	10/11/12	SEABOSS
SB-05-3	SOL	41.11333333	-73.1215	10/11/12	SEABOSS
SB-05-3	EOL	41.11306667	-73.12041667	10/11/12	SEABOSS
SB-06-1	SOL	41.1118	-73.08528333	10/10/12	SEABOSS
SB-06-1	EOL	41.11175	-73.08471667	10/10/12	SEABOSS
SB-06-2	SOL	41.11606667	-73.08381667	10/10/12	SEABOSS
SB-06-2	EOL	41.11601667	-73.08341667	10/10/12	SEABOSS
SB-06-3	SOL	41.11118333	-73.08336667	10/10/12	SEABOSS
SB-06-3	EOL	41.11113333	-73.08291667	10/10/12	SEABOSS
SB-06-4	SOL	41.11463333	-73.08296667	10/10/12	SEABOSS
SB-06-4	EOL	41.11453333	-73.08258333	10/10/12	SEABOSS
SB-06-5	SOL	41.11341667	-73.07851667	10/10/12	SEABOSS
SB-06-5	EOL	41.11341667	-73.07821667	10/10/12	SEABOSS
SB-06-6	SOL	41.11288333	-73.08233333	10/10/12	SEABOSS
SB-06-6	EOL	41.1128	-73.08206667	10/10/12	SEABOSS
SB-07-1	SOL	41.09505	-73.12861667	10/11/12	SEABOSS
SB-07-1	EOL	41.09473333	-73.12758333	10/11/12	SEABOSS
SB-07-2	SOL	41.0923	-73.12965	10/11/12	SEABOSS
SB-07-2	EOL	41.09228333	-73.12855	10/11/12	SEABOSS
SB-07-3	SOL	41.0976	-73.12645	10/11/12	SEABOSS
SB-07-3	EOL	41.09758333	-73.12581667	10/11/12	SEABOSS
SB-08-1	SOL	41.0873	-73.10535	10/15/12	SEABOSS
SB-08-1	EOL	41.08773333	-73.10553333	10/15/12	SEABOSS
SB-08-2	SOL	41.08326667	-73.10063333	10/15/12	SEABOSS
SB-08-2	EOL	41.08365	-73.10076667	10/15/12	SEABOSS
SB-08-3	SOL	41.08856667	-73.09948333	10/15/12	SEABOSS
SB-08-3	EOL	41.08905	-73.0997	10/15/12	SEABOSS
SB-09-3	SOL	41.08938333	-73.07118333	10/15/12	SEABOSS
SB-09-3	EOL	41.08978333	-73.07125	10/15/12	SEABOSS
SB-09-4	SOL	41.088185	-73.074087	10/15/12	SEABOSS
SB-09-4	EOL	41.08858333	-73.07398333	10/15/12	SEABOSS
SB-09-5	SOL	41.088138	-73.068542	10/15/12	SEABOSS

SB-09-5	EOL	41.08866667	-73.0685	10/15/12 SEABOSS
SB-10-1	SOL	41.08148333	-73.1354	10/11/12 SEABOSS
SB-10-1	EOL	41.08146667	-73.13501667	10/11/12 SEABOSS
SB-10-2	SOL	41.08176667	-73.13333333	10/11/12 SEABOSS
SB-10-2	EOL	41.08175	-73.13285	10/11/12 SEABOSS
SB-10-3	SOL	41.0746	-73.13121667	10/11/12 SEABOSS
SB-10-3	EOL	41.07455	-73.13085	10/11/12 SEABOSS
SB-11-1	SOL	41.070962	-73.106893	10/13/12 SEABOSS
SB-11-1	EOL	41.07088333	-73.10658333	10/13/12 SEABOSS
SB-11-2	SOL	41.075272	-73.11481	10/13/12 SEABOSS
SB-11-2	EOL	41.07553333	-73.11505	10/13/12 SEABOSS
SB-11-3	SOL	41.075408	-73.108702	10/13/12 SEABOSS
SB-11-3	EOL	41.07525	-73.10836667	10/13/12 SEABOSS
SB-12-1	SOL	41.07053333	-73.07378333	10/15/12 SEABOSS
SB-12-1	EOL	41.07086667	-73.0735	10/15/12 SEABOSS
SB-12-2	SOL	41.07171667	-73.07666667	10/15/12 SEABOSS
SB-12-2	EOL	41.07215	-73.07631667	10/15/12 SEABOSS
SB-12-3	SOL	41.07615	-73.07738333	10/15/12 SEABOSS
SB-12-3	EOL	41.07666667	-73.07618333	10/15/12 SEABOSS
SB-12-4	SOL	41.07335	-73.07185	10/15/12 SEABOSS
SB-12-4	EOL	41.07375	-73.07116667	10/15/12 SEABOSS
SB-12-5	SOL	41.06833333	-73.07341667	10/15/12 SEABOSS
SB-12-5	EOL	41.06866667	-73.07281667	10/15/12 SEABOSS
SB-12-6	SOL	41.0693	-73.0776	10/15/12 SEABOSS
SB-12-6	EOL	41.06971667	-73.0769	10/15/12 SEABOSS
SB-12-7	SOL	41.07561667	-73.07813333	10/15/12 SEABOSS
SB-12-7	EOL	41.0762	-73.07696667	10/15/12 SEABOSS
SB-12-8	SOL	41.07121667	-73.07901667	10/15/12 SEABOSS
SB-12-8	EOL	41.07168333	-73.07763333	10/15/12 SEABOSS
SB-12-9	SOL	41.07431667	-73.07515	10/15/12 SEABOSS
SB-12-9	EOL	41.07465	-73.0744	10/15/12 SEABOSS
SB-13-1	SOL	41.06415	-73.13928333	10/12/12 SEABOSS
SB-13-1	EOL	41.06371667	-73.13921667	10/12/12 SEABOSS
SB-13-2	SOL	41.0689667	-73.14246667	10/12/12 SEABOSS
SB-13-2	EOL	41.0686333	-73.1424	10/12/12 SEABOSS
SB-13-3	SOL	41.0662	-73.14051667	10/12/12 SEABOSS
SB-13-3	EOL	41.06563333	-73.14061667	10/12/12 SEABOSS
SB-14-1	SOL	41.05945	-73.04886667	10/15/12 SEABOSS
SB-14-1	EOL	41.05993333	-73.0481	10/15/12 SEABOSS
SB-14-2	SOL	41.06453333	-73.04691667	10/15/12 SEABOSS
SB-14-2	EOL	41.06513333	-73.04596667	10/15/12 SEABOSS
SB-14-3	SOL	41.06596667	-73.05446667	10/15/12 SEABOSS
SB-14-3	EOL	41.06616667	-73.05416667	10/15/12 SEABOSS
SB-15-1	SOL	41.059092	-73.026333	10/17/12 SEABOSS
SB-15-1	EOL	41.05898333	-73.02615	10/17/12 SEABOSS
SB-15-2	SOL	41.064097	-73.03073	10/17/12 SEABOSS
SB-15-2	EOL	41.0636	-73.03118333	10/17/12 SEABOSS
SB-15-3	SOL	41.060878	-73.031675	10/17/12 SEABOSS

SB-15-3	EOL	41.06088333	-73.0321	10/17/12	SEABOSS
SB-16-1	SOL	41.047727	-73.135652	10/17/12	SEABOSS
SB-16-1	EOL	41.04756667	-73.13575	10/17/12	SEABOSS
SB-16-2	SOL	41.047643	-73.132642	10/17/12	SEABOSS
SB-16-2	EOL	41.04748333	-73.13271667	10/17/12	SEABOSS
SB-16-3	SOL	41.051588	-73.138037	10/17/12	SEABOSS
SB-16-3	EOL	41.05166667	-73.13853333	10/17/12	SEABOSS
SB-17-1	SOL	41.046318	-73.122792	10/13/12	SEABOSS
SB-17-1	EOL	41.04616667	-73.12215	10/13/12	SEABOSS
SB-17-2	SOL	41.049123	-73.11893	10/13/12	SEABOSS
SB-17-2	EOL	41.04883333	-73.1184	10/13/12	SEABOSS
SB-17-3	SOL	41.04617	-73.121173	10/13/12	SEABOSS
SB-17-3	EOL	41.0458	-73.12063333	10/13/12	SEABOSS
SB-18-1	SOL	41.046505	-73.10025	10/13/12	SEABOSS
SB-18-1	EOL	41.04631667	-73.0999	10/13/12	SEABOSS
SB-18-2	SOL	41.051392	-73.096477	10/13/12	SEABOSS
SB-18-2	EOL	41.05116667	-73.09568333	10/13/12	SEABOSS
SB-18-3	SOL	41.049908	-73.102042	10/13/12	SEABOSS
SB-18-3	EOL	41.05008333	-73.10173333	10/13/12	SEABOSS
SB-19-1	SOL	41.042985	-73.078253	10/13/12	SEABOSS
SB-19-1	EOL	41.0427	-73.07815	10/13/12	SEABOSS
SB-19-2	SOL	41.04664	-73.079553	10/13/12	SEABOSS
SB-19-2	EOL	41.04626667	-73.08003333	10/13/12	SEABOSS
SB-19-4	SOL	41.04908	-73.082618	10/13/12	SEABOSS
SB-19-4	EOL	41.04886667	-73.08301667	10/13/12	SEABOSS
SB-20-1	SOL	41.046288	-73.011475	10/16/12	SEABOSS
SB-20-1	EOL	41.04601667	-73.00991667	10/16/12	SEABOSS
SB-20-2	SOL	41.046455	-73.015502	10/16/12	SEABOSS
SB-20-2	EOL	41.0463	-73.01475	10/16/12	SEABOSS
SB-20-3	SOL	41.04603333	-73.01983333	10/16/12	SEABOSS
SB-20-3	EOL	41.0457	-73.01878333	10/16/12	SEABOSS
SB-21-1	SOL	41.035417	-73.107047	10/13/12	SEABOSS
SB-21-1	EOL	41.03478333	-73.10621667	10/13/12	SEABOSS
SB-21-2	SOL	41.041308	-73.111447	10/13/12	SEABOSS
SB-21-2	EOL	41.04188333	-73.11068333	10/13/12	SEABOSS
SB-21-3	SOL	41.0395578	-73.1048	10/13/12	SEABOSS
SB-21-3	EOL	41.03938333	-73.104	10/13/12	SEABOSS
SB-22-1	SOL	41.032818	-73.058137	10/15/12	SEABOSS
SB-22-1	EOL	41.03325	-73.05736667	10/15/12	SEABOSS
SB-22-2	SOL	41.029007	-73.061258	10/15/12	SEABOSS
SB-22-2	EOL	41.02961667	-73.06061667	10/15/12	SEABOSS
SB-22-3	SOL	41.030005	-73.05523	10/15/12	SEABOSS
SB-22-3	EOL	41.03058333	-73.05463333	10/15/12	SEABOSS
SB-23-1	SOL	41.039872	-73.029473	10/16/12	SEABOSS
SB-23-1	EOL	41.03911667	-73.02963333	10/16/12	SEABOSS
SB-23-2	SOL	41.033453	-73.029805	10/16/12	SEABOSS
SB-23-2	EOL	41.03271667	-73.03	10/16/12	SEABOSS
SB-23-3	SOL	41.036802	-73.026783	10/16/12	SEABOSS

SB-23-3	EOL	41.03605	-73.02688333	10/16/12	SEABOSS
SB-24-1	SOL	41.0334	-72.98123333	10/16/12	SEABOSS
SB-24-1	EOL	41.03293333	-72.9802	10/16/12	SEABOSS
SB-24-2	SOL	41.03816667	-72.98583333	10/16/12	SEABOSS
SB-24-2	EOL	41.03783333	-72.98491667	10/16/12	SEABOSS
SB-24-3	SOL	41.03511667	-72.9856	10/16/12	SEABOSS
SB-24-3	EOL	41.03461667	-72.98463333	10/16/12	SEABOSS
SB-25-1	SOL	41.029463	-73.113718	10/12/12	SEABOSS
SB-25-1	EOL	41.0296	-73.11348333	10/12/12	SEABOSS
SB-25-2	SOL	41.024117	-73.105862	10/12/12	SEABOSS
SB-25-2	EOL	41.02418333	-73.10548333	10/12/12	SEABOSS
SB-25-3	SOL	41.02521	-73.113905	10/12/12	SEABOSS
SB-25-3	EOL	41.02535	-73.11346667	10/12/12	SEABOSS
SB-27-1	SOL	41.01811667	-72.99298333	10/16/12	SEABOSS
SB-27-1	EOL	41.01781667	-72.99215	10/16/12	SEABOSS
SB-27-2	SOL	41.02296667	-72.99358333	10/16/12	SEABOSS
SB-27-2	EOL	41.02263333	-72.99291667	10/16/12	SEABOSS
SB-27-3	SOL	41.021	-72.99318333	10/16/12	SEABOSS
SB-27-3	EOL	41.02085	-72.99241667	10/16/12	SEABOSS
SB-28-1	SOL	41.01083	-73.139872	10/12/12	SEABOSS
SB-28-1	EOL	41.01041667	-73.13938333	10/12/12	SEABOSS
SB-28-2	SOL	41.012003	-73.138793	10/12/12	SEABOSS
SB-28-2	EOL	41.01151667	-73.1383	10/12/12	SEABOSS
SB-28-3	SOL	41.014402	-73.145168	10/12/12	SEABOSS
SB-28-3	EOL	41.01391667	-73.14478333	10/12/12	SEABOSS
SB-29-1	SOL	41.01081667	-73.11298333	10/12/12	SEABOSS
SB-29-1	EOL	41.01045	-73.1117	10/12/12	SEABOSS
SB-29-2	SOL	41.007535	-73.119497	10/12/12	SEABOSS
SB-29-2	EOL	41.00736667	-73.1187	10/12/12	SEABOSS
SB-29-3	SOL	41.01172	-73.116165	10/12/12	SEABOSS
SB-29-3	EOL	41.01143333	-73.11555	10/12/12	SEABOSS
SB-30-1	SOL	41.002975	-73.085345	10/17/12	SEABOSS
SB-30-1	EOL	41.00255	-73.08513333	10/17/12	SEABOSS
SB-30-2	SOL	41.006733	-73.089485	10/17/12	SEABOSS
SB-30-2	EOL	41.00673333	-73.0897	10/17/12	SEABOSS
SB-30-3	SOL	41.009448	-73.091753	10/17/12	SEABOSS
SB-30-3	EOL	41.00926667	-73.092	10/17/12	SEABOSS
SB-31-1	SOL	41.007908	-73.024238	10/16/12	SEABOSS
SB-31-1	EOL	41.00725	-73.02406667	10/16/12	SEABOSS
SB-31-2	SOL	41.012222	-73.021157	10/16/12	SEABOSS
SB-31-2	EOL	41.01155	-73.02085	10/16/12	SEABOSS
SB-31-3	SOL	41.01036667	-73.02436667	10/16/12	SEABOSS
SB-31-3	EOL	41.00951667	-73.02403333	10/16/12	SEABOSS
SB-32-1	SOL	41.01396667	-72.97516667	10/14/12	SEABOSS
SB-32-1	EOL	41.01456667	-72.97488333	10/14/12	SEABOSS
SB-32-2	SOL	41.019523	-72.976502	10/14/12	SEABOSS
SB-32-2	EOL	41.02038333	-72.9759	10/14/12	SEABOSS
SB-32-3	SOL	41.016848	-72.979758	10/14/12	SEABOSS

SB-32-3	EOL	41.01748333	-72.97955	10/14/12	SEABOSS
SB-33-1	SOL	40.994525	-73.126078	10/12/12	SEABOSS
SB-33-1	EOL	40.99408333	-73.12478333	10/12/12	SEABOSS
SB-33-2	SOL	40.996908	-73.126008	10/12/12	SEABOSS
SB-33-2	EOL	40.99655	-73.12516667	10/12/12	SEABOSS
SB-33-3	SOL	40.99733	-73.122508	10/12/12	SEABOSS
SB-33-3	EOL	40.9971	-73.12201667	10/12/12	SEABOSS
SB-34-1	SOL	41.00018333	-72.9579	10/14/12	SEABOSS
SB-34-1	EOL	41.00023333	-72.9564	10/14/12	SEABOSS
SB-34-2	SOL	41.00095	-72.9612	10/14/12	SEABOSS
SB-34-2	EOL	41.001	-72.95933333	10/14/12	SEABOSS
SB-34-3	SOL	41.00175	-72.96301667	10/14/12	SEABOSS
SB-34-3	EOL	41.00196667	-72.9617	10/14/12	SEABOSS

2012 ISIS Log, December, 2012

10 Dec 2012

ISIS Set-up on RV Loosanoff

Video 1 - Feed from Aurora 1 CCD video camera
↳ goes to RMS 0/GPT Horita "Video IN"

Horita "video OUT" goes to yellow "Input 1" on DVDR

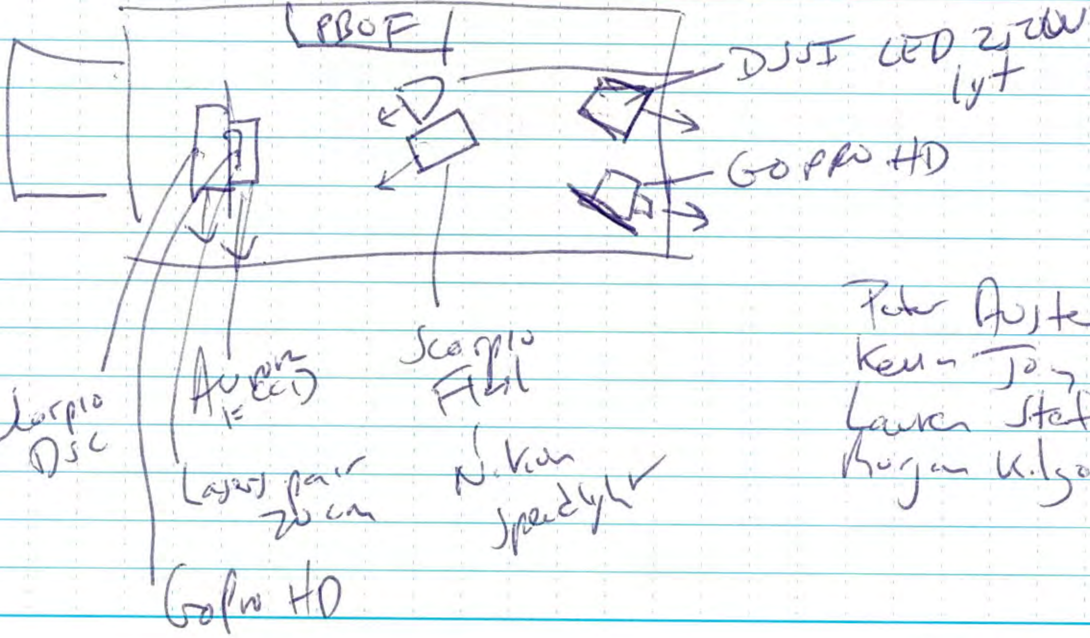
DVDR yellow "Output 1" to bottom monitor

Video 2 - from Insite Pacific Scorpio Plus DSC
↳ to top monitor

GPS from bridge to "serial in" on Horita
↳ Model Furuno Navnet C-Map NT Max

Lasers (parallel - downward) 20 cm spacing.

ISIS Config.



Peter Auster
Kevin Joy
Lauren Stefaniak
Morgan Kilgour

Scale: 1 square =

12 Dec 2012

0800 – U/W from Milford dock to "Sponge City" site – SS3
41° 02.316 / 073 06.558

TIDES Dec 12
Bridgeport 0941 – High
1613 – Low
Dec 13
1034 – High
1705 – Low

DIVE 1 64 ft under hull
41° 02.318' 073° 06.547

1450/0915 – In water 48°F surface
UTC

1631 – off bottom

1645 – on deck

boulders with coral, Cliona, spider crab, hermit crab,
transition zone w/ scattered boulders, cobble, crepidula shell

Scorpio Images – large boulders >50% cover
small boulder/cobble <40% cover
cobble-shell w/ surrounding sand ~10%

No sponges Haliclona as in past – species interactions (predation, competition)?, life history?, disease?, temp stress?

Scorpio – first images set to "Normal" then to "Fine"
reset time mid-dive ~20 stills of boulder surfaces

GoPro – success! Edit HD for clips & stills

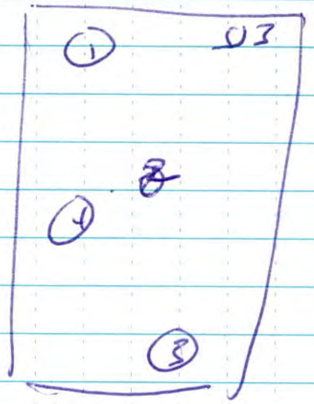
Aaron – recorded to hard drive on deck – set to "fine" part to DVD,

Scale: 1 square = ______

Multiple drifts past boulder reef along crest of shoal.

Positions on boulders

1- boulders	41 02.324	073 06.578
2- large bldrs -	41 02.306	073 06.572
✗✗		
3-	41 02.277	073 06.556
4-	41 02.310	073 06.570



1205 - UW for Charles Island sites CI3

DIVE 2 Charles Island CI-3

1812-1828 41° 11.013'/073° 03.823' 26 ft.

Gravel - boulders

Cliona, coral, spider crab, Asterias ⇒ Crepidula, oyster shell transitions from boulders

DIVE 3 Charles Island CI2 (-1,-2,-3) 1832-1849

mud, boulders, shell hash 2-3 41 11.057 73 03.776

oyster, whelk, sponge Cliona 2-2 41 11.066 73 03.771

2-1 41 11.075 73 03.766

DAVEY Charles Island CI-1 (1-2)

1903-1915

1-1 41 11.261 / 73 03.730

1-2 41 11.256 / 73 03.712

mud, gravel, boulder, shell

dense Crepidula transitions from and within boulder reef

urchin, sponge-Cliona, coral

UW for Milford dock

1445 - lines on dock

Scale: 1 square = ______________

13 Dec 2012 RV Loosanoff

0740 - U/W from Milford Dock

- heading to northern transect sites
- plan is to traverse reef along line 3 - NT3

41 02.690/73 06.576 → 41 02.652/73 06.379

0856 - on site - had "diet size" black & white from Starbucks

DIVES

1406 UTC/0906 - in water

GoPro 0855

Scorpio DSC
GoPro HD-2
Aurora SD

Transect 1 - NNW - SSE along reef
drift ~1.2 kt
- start in dense boulders - no Haliclona sponges.
- 64 ft → 71 ft. to transition of shell debris

Transect 2 - same course but ~100 yds to east
- fewer boulders but covered reef
- no Haliclona sponges.

Transect 3 - between lines 1 + 2 - boulders, shell debris along margins - no sponges

Transect 4 - 59 ft → 67 ft. - started in dense boulders - ~~drift~~ transit to east side of reef - sparse large boulders

1548/1048 - on deck

Dive 6

1617/1117 - In water
UTC
- on bottom - cobble - shell

GoPro slows over seafloor - good test of utility for frame grabs, for analysis ?

1649 - sponges?
- abundant *Libinia*
- review stills for small *Halichondria*?
  looked similar enough.

1654/1154 - on deck

UW to SB11-T1 Eastern end *Crepidula* mounds
41° 04.5769/073 06.54712 → 41° 04.5756/073 06.37466

Dive 7

1719/1219 - In water
- Patchy high density *Crepidula* on gravel-sand

drift 0.5 kt
- barnacles, horseshoe crabs, few patchy corals on boulders

1743/1243 - on deck

1744/1244 - back to the barn!!

1845/1345 - at dock

12-12 - 145 image files
12-13 - 156 image files

12 May 2017 R/V Connecticut

2310 - uw from Avery Pt. Dock

Primary site for the dive

SB-05-T2

41 06.789733/073 07.296688 →
41 06.603859/073 07.084022

If weather-seas high - alternate site ✓

SB-33-T3

40 59.52904/073 07.836499 →
40 59. ~~726473~~ 527636 /073 07.624116

Peter Auster
Lauren Stefaniak
Morgan Kilgour
Andrea McCarthy
Donna Chadi
Kevin Joy
Matthew Jewell

Scale: 1 square = ______

2013 SEABOSS Photo Log, May, 2013

STATION	PHOTO	ARCHIVE.JPG	LATITUDE	LONGITUDE	DATE	DEVICE
NB-1	NB-1-1	DSC_0432.JPG	41.161183	-73.077895	5/21/13	SEABOSS
NB-1	NB-1-2	DSC_0433.JPG	41.161202	-73.07785	5/21/13	SEABOSS
NB-1	NB-1-3	DSC_0434.JPG	41.161208	-73.07783	5/21/13	SEABOSS
NB-1	NB-1-4	DSC_0435.JPG	41.161223	-73.07778	5/21/13	SEABOSS
NB-2	NB-2-1	DSC_0436.JPG	41.145952	-73.074213	5/21/13	SEABOSS
NB-2	NB-2-2	DSC_0437.JPG	41.14591	-73.074255	5/21/13	SEABOSS
NB-2	NB-2-3	DSC_0438.JPG	41.145858	-73.07431	5/21/13	SEABOSS
NB-2	NB-2-4	DSC_0439.JPG	41.145827	-73.074345	5/21/13	SEABOSS
NB-2	NB-2-5	DSC_0440.JPG	41.14579	-73.074392	5/21/13	SEABOSS
NB-3	NB-3-1	DSC_0565.JPG	41.12745	-73.069132	5/21/13	SEABOSS
NB-3	NB-3-2	DSC_0566.JPG	41.127447	-73.069082	5/21/13	SEABOSS
NB-3	NB-3-3	DSC_0567.JPG	41.127448	-73.069032	5/21/13	SEABOSS
NB-3	NB-3-4	DSC_0568.JPG	41.127452	-73.068967	5/21/13	SEABOSS
NB-4	NB-4-1	DSC_0696.JPG	41.10235	-73.066185	5/21/13	SEABOSS
NB-4	NB-4-2	DSC_0697.JPG	41.10235	-73.066133	5/21/13	SEABOSS
NB-4	NB-4-3	DSC_0698.JPG	41.102353	-73.066048	5/21/13	SEABOSS
NB-4	NB-4-4	DSC_0699.JPG	41.10236	-73.065945	5/21/13	SEABOSS
NB-5	NB-5-1	DSC_0700.JPG	41.097215	-73.051405	5/21/13	SEABOSS
NB-5	NB-5-2	DSC_0701.JPG	41.097195	-73.051378	5/21/13	SEABOSS
NB-5	NB-5-3	DSC_0702.JPG	41.097178	-73.051348	5/21/13	SEABOSS
NB-5	NB-5-4	DSC_0703.JPG	41.097168	-73.051325	5/21/13	SEABOSS
NB-5	NB-5-5	DSC_0704.JPG	41.09716	-73.051297	5/21/13	SEABOSS
NB-5	NB-5-6	DSC_0705.JPG	41.097158	-73.051235	5/21/13	SEABOSS
NB-6	NB-6-1	DSC_0707.JPG	41.081877	-73.051085	5/21/13	SEABOSS
NB-6	NB-6-2	DSC_0708.JPG	41.08194	-73.05112	5/21/13	SEABOSS
NB-6	NB-6-3	DSC_0709.JPG	41.08203	-73.051162	5/21/13	SEABOSS
NB-6	NB-6-4	DSC_0710.JPG	41.08218	-73.051215	5/21/13	SEABOSS
NB-6	NB-6-5	DSC_0711.JPG	41.082252	-73.051233	5/21/13	SEABOSS
NB-7	NB-7-1	DSC_0794.JPG	41.052597	-73.0042	5/22/13	SEABOSS
NB-7	NB-7-2	DSC_0795.JPG	41.052633	-73.004348	5/22/13	SEABOSS
NB-7	NB-7-3	DSC_0796.JPG	41.052667	-73.00449	5/22/13	SEABOSS
NB-7	NB-7-4	DSC_0797.JPG	41.052707	-73.004707	5/22/13	SEABOSS
NB-8	NB-8-1	DSC_0799.JPG	41.031985	-73.010365	5/22/13	SEABOSS
NB-8	NB-8-2	DSC_0800.JPG	41.031998	-73.01052	5/22/13	SEABOSS
NB-8	NB-8-3	DSC_0801.JPG	41.031982	-73.010652	5/22/13	SEABOSS
NB-8	NB-8-4	DSC_0802.JPG	41.03197	-73.010685	5/22/13	SEABOSS
NB-8	NB-8-5	DSC_0803.JPG	41.031968	-73.01069	5/22/13	SEABOSS
NB-9	NB-9-1	DSC_0955.JPG	41.003003	-73.035982	5/22/13	SEABOSS
NB-9	NB-9-2	DSC_0956.JPG	41.003077	-73.035932	5/22/13	SEABOSS
NB-9	NB-9-3	DSC_0957.JPG	41.003097	-73.035903	5/22/13	SEABOSS
NB-9	NB-9-4	DSC_0958.JPG	41.003123	-73.035862	5/22/13	SEABOSS
NB-10	NB-10-1	DSC-1590.JPG	41.04383	-73.044028	5/23/13	SEABOSS
NB-10	NB-10-2	DSC-1591.JPG	41.043957	-73.043918	5/23/13	SEABOSS
NB-10	NB-10-3	DSC-1592.JPG	41.044005	-73.043883	5/23/13	SEABOSS

NB-10	NB-10-4	DSC-1593.JPG	41.044155	-73.043767	5/23/13	SEABOSS
NB-10	NB-10-5	DSC-1594.JPG	41.044278	-73.043678	5/23/13	SEABOSS
NB-11	NB-11-1	DSC_0960.JPG	41.01056	-73.061018	5/22/13	SEABOSS
NB-11	NB-11-2	DSC_0961.JPG	41.010535	-73.060915	5/22/13	SEABOSS
NB-11	NB-11-3	DSC_0962.JPG	41.010517	-73.06084	5/22/13	SEABOSS
NB-11	NB-11-4	DSC_0963.JPG	41.0105	-73.060775	5/22/13	SEABOSS
NB-12	NB-12-1	DSC-1585.JPG	41.049835	-73.059988	5/23/13	SEABOSS
NB-12	NB-12-2	DSC-1586.JPG	41.04994	-73.059917	5/23/13	SEABOSS
NB-12	NB-12-3	DSC-1587.JPG	41.050085	-73.059817	5/23/13	SEABOSS
NB-12	NB-12-4	DSC-1588.JPG	41.050202	-73.05975	5/23/13	SEABOSS
NB-13	NB-13-1	DSC_0963.JPG	41.0105	-73.060775	5/22/13	SEABOSS
NB-13	NB-13-2	DSC_0964.JPG	41.015647	-73.068255	5/22/13	SEABOSS
NB-13	NB-13-3	DSC_0965.JPG	41.025312	-73.082047	5/22/13	SEABOSS
NB-13	NB-13-4	DSC_0966.JPG	41.025295	-73.082007	5/22/13	SEABOSS
NB-14	NB-14-1	DSC_1406.JPG	41.034698	-73.14264	5/23/13	SEABOSS
NB-14	NB-14-2	DSC_1407.JPG	41.034757	-73.142598	5/23/13	SEABOSS
NB-14	NB-14-3	DSC_1408.JPG	41.034827	-73.142538	5/23/13	SEABOSS
NB-14	NB-14-4	DSC_1409.JPG	41.034883	-73.14249	5/23/13	SEABOSS
NB-15	NB-15-1	DSC_1427.JPG	41.048947	-73.158252	5/23/13	SEABOSS
NB-15	NB-15-2	DSC_1428.JPG	41.048993	-73.158197	5/23/13	SEABOSS
NB-15	NB-15-3	DSC_1429.JPG	41.049048	-73.15813	5/23/13	SEABOSS
NB-15	NB-15-4	DSC_1430.JPG	41.049078	-73.158093	5/23/13	SEABOSS
NB-16	NB-16-1	DSC_1537.JPG	41.072847	-73.157443	5/23/13	SEABOSS
NB-16	NB-16-2	DSC_1538.JPG	41.072922	-73.157347	5/23/13	SEABOSS
NB-16	NB-16-3	DSC_1539.JPG	41.07301	-73.157242	5/23/13	SEABOSS
NB-16	NB-16-4	DSC_1540.JPG	41.073068	-73.157175	5/23/13	SEABOSS
NB-16	NB-16-5	DSC_1541.JPG	41.07318	-73.157062	5/23/13	SEABOSS
NB-17	NB-17-1	DSC_1561.JPG	41.101545	-73.153427	5/23/13	SEABOSS
NB-17	NB-17-2	DSC_1562.JPG	41.101703	-73.15335	5/23/13	SEABOSS
NB-17	NB-17-3	DSC_1563.JPG	41.101827	-73.15328	5/23/13	SEABOSS
NB-17	NB-17-4	DSC_1564.JPG	41.101955	-73.153205	5/23/13	SEABOSS
SBM-03-1	SBM-03-	DSC_0442.JPG	41.132907	-73.087743	5/21/13	SEABOSS
SBM-03-1	SBM-03-	DSC_0443.JPG	41.132923	-73.087793	5/21/13	SEABOSS
SBM-03-1	SBM-03-	DSC_0444.JPG	41.132945	-73.087862	5/21/13	SEABOSS
SBM-03-1	SBM-03-	DSC_0445.JPG	41.132963	-73.087923	5/21/13	SEABOSS
SBM-03-2	SBM-03-	DSC_0446.JPG	41.135245	-73.089443	5/21/13	SEABOSS
SBM-03-2	SBM-03-	DSC_0447.JPG	41.135272	-73.089497	5/21/13	SEABOSS
SBM-03-2	SBM-03-	DSC_0448.JPG	41.135293	-73.089552	5/21/13	SEABOSS
SBM-03-2	SBM-03-	DSC_0449.JPG	41.13532	-73.08963	5/21/13	SEABOSS
SBM-03-3	SBM-03-	DSC_0451.JPG	41.137868	-73.090033	5/21/13	SEABOSS
SBM-03-3	SBM-03-	DSC_0452.JPG	41.137902	-73.08996	5/21/13	SEABOSS
SBM-03-3	SBM-03-	DSC_0453.JPG	41.137923	-73.089905	5/21/13	SEABOSS
SBM-03-3	SBM-03-	DSC_0454.JPG	41.137948	-73.08984	5/21/13	SEABOSS
SBM-03-3	SBM-03-	DSC_0455.JPG	41.137973	-73.089767	5/21/13	SEABOSS
SBM-05-1	SBM-05-	DSC_1566.JPG	41.110247	-73.118557	5/23/13	SEABOSS

SBM-05-1	SBM-05-	DSC_1567.JPG	41.110333	-73.118445	5/23/13	SEABOSS
SBM-05-1	SBM-05-	DSC_1568.JPG	41.110428	-73.118325	5/23/13	SEABOSS
SBM-05-1	SBM-05-	DSC_1569.JPG	41.110455	-73.118293	5/23/13	SEABOSS
SBM-05-1	SBM-05-	DSC_1570.JPG	41.110475	-73.118268	5/23/13	SEABOSS
SBM-05-1	SBM-05-	DSC_1571.JPG	41.110527	-73.118195	5/23/13	SEABOSS
SBM-05-1	SBM-05-	DSC_1572.JPG	41.110543	-73.11817	5/23/13	SEABOSS
SBM-05-2	SBM-05-	DSC_1574.JPG	41.113737	-73.119223	5/23/13	SEABOSS
SBM-05-2	SBM-05-	DSC_1575.JPG	41.113802	-73.119243	5/23/13	SEABOSS
SBM-05-2	SBM-05-	DSC_1576.JPG	41.113898	-73.11923	5/23/13	SEABOSS
SBM-05-2	SBM-05-	DSC_1577.JPG	41.113943	-73.119217	5/23/13	SEABOSS
SBM-05-3	SBM-05-	DSC_1579.JPG	41.115997	-73.121837	5/23/13	SEABOSS
SBM-05-3	SBM-05-	DSC_1580.JPG	41.116035	-73.12184	5/23/13	SEABOSS
SBM-05-3	SBM-05-	DSC_1581.JPG	41.116063	-73.12184	5/23/13	SEABOSS
SBM-05-3	SBM-05-	DSC_1582.JPG	41.116108	-73.121832	5/23/13	SEABOSS
SBM-05-3	SBM-05-	DSC_1583.JPG	41.116193	-73.121813	5/23/13	SEABOSS
SBM-06-1	SBM-06-	DSC_0570.JPG	41.109815	-73.084915	5/21/13	SEABOSS
SBM-06-1	SBM-06-	DSC_0571.JPG	41.109787	-73.084942	5/21/13	SEABOSS
SBM-06-1	SBM-06-	DSC_0572.JPG	41.109767	-73.084957	5/21/13	SEABOSS
SBM-06-1	SBM-06-	DSC_0573.JPG	41.109747	-73.084972	5/21/13	SEABOSS
SBM-06-2	SBM-06-	DSC_0574.JPG	41.112687	-73.084063	5/21/13	SEABOSS
SBM-06-2	SBM-06-	DSC_0576.JPG	41.112747	-73.084003	5/21/13	SEABOSS
SBM-06-2	SBM-06-	DSC_0577.JPG	41.11281	-73.083945	5/21/13	SEABOSS
SBM-06-2	SBM-06-	DSC_0578.JPG	41.112877	-73.083883	5/21/13	SEABOSS
SBM-06-3	SBM-06-	DSC_0580.JPG	41.115508	-73.080447	5/21/13	SEABOSS
SBM-06-3	SBM-06-	DSC_0581.JPG	41.11553	-73.080433	5/21/13	SEABOSS
SBM-06-3	SBM-06-	DSC_0582.JPG	41.115547	-73.080437	5/21/13	SEABOSS
SBM-06-3	SBM-06-	DSC_0583.JPG	41.11557	-73.080452	5/21/13	SEABOSS
SBM-06-4	SBM-06-	DSC_0585.JPG	41.116377	-73.086125	5/21/13	SEABOSS
SBM-06-4	SBM-06-	DSC_0586.JPG	41.116418	-73.086142	5/21/13	SEABOSS
SBM-06-4	SBM-06-	DSC_0587.JPG	41.116467	-73.086152	5/21/13	SEABOSS
SBM-06-4	SBM-06-	DSC_0588.JPG	41.11654	-73.086153	5/21/13	SEABOSS
SBM-06-5	SBM-06-	DSC_0589.JPG	41.111718	-73.07886	5/21/13	SEABOSS
SBM-06-5	SBM-06-	DSC_0590.JPG	41.111742	-73.078757	5/21/13	SEABOSS
SBM-06-5	SBM-06-	DSC_0591.JPG	41.111792	-73.078645	5/21/13	SEABOSS
SBM-06-5	SBM-06-	DSC_0592.JPG	41.11195	-73.07836	5/21/13	SEABOSS
SBM-06-6	SBM-06-	DSC_0691.JPG	41.110343	-73.080783	5/21/13	SEABOSS
SBM-06-6	SBM-06-	DSC_0692.JPG	41.110365	-73.080693	5/21/13	SEABOSS
SBM-06-6	SBM-06-	DSC_0693.JPG	41.110382	-73.080627	5/21/13	SEABOSS
SBM-06-6	SBM-06-	DSC_0694.JPG	41.110405	-73.080553	5/21/13	SEABOSS
SBM-11-1	SBM-11-	DSC_1543.JPG	41.07113	-73.108783	5/23/13	SEABOSS
SBM-11-1	SBM-11-	DSC_1544.JPG	41.071283	-73.108748	5/23/13	SEABOSS
SBM-11-1	SBM-11-	DSC_1545.JPG	41.071405	-73.10871	5/23/13	SEABOSS
SBM-11-1	SBM-11-	DSC_1546.JPG	41.071497	-73.10866	5/23/13	SEABOSS
SBM-11-1	SBM-11-	DSC_1547.JPG	41.071608	-73.108555	5/23/13	SEABOSS
SBM-11-2	SBM-11-	DSC_1549.JPG	41.071907	-73.112118	5/23/13	SEABOSS

SBM-11-2	SBM-11-	DSC_1550.JPG	41.071928	-73.112108	5/23/13	SEABOSS
SBM-11-2	SBM-11-	DSC_1551.JPG	41.07215	-73.11179	5/23/13	SEABOSS
SBM-11-2	SBM-11-	DSC_1552.JPG	41.072232	-73.111685	5/23/13	SEABOSS
SBM-11-3	SBM-11-	DSC_1554.JPG	41.07514	-73.109428	5/23/13	SEABOSS
SBM-11-3	SBM-11-	DSC_1555.JPG	41.075195	-73.109367	5/23/13	SEABOSS
SBM-11-3	SBM-11-	DSC_1556.JPG	41.075243	-73.109318	5/23/13	SEABOSS
SBM-11-3	SBM-11-	DSC_1557.JPG	41.075282	-73.109262	5/23/13	SEABOSS
SBM-11-3	SBM-11-	DSC_1558.JPG	41.075323	-73.109188	5/23/13	SEABOSS
SBM-11-3	SBM-11-	DSC_1559.JPG	41.075335	-73.109167	5/23/13	SEABOSS
SBM-12-1	SBM-12-	DSC_1835.JPG	41.075147	-73.077905	5/24/13	SEABOSS
SBM-12-1	SBM-12-	DSC_1836.JPG	41.075137	-73.077903	5/24/13	SEABOSS
SBM-12-1	SBM-12-	DSC_1837.JPG	41.075123	-73.077903	5/24/13	SEABOSS
SBM-12-1	SBM-12-	DSC_1838.JPG	41.075117	-73.077905	5/24/13	SEABOSS
SBM-12-1	SBM-12-	DSC_1839.JPG	41.07509	-73.07792	5/24/13	SEABOSS
SBM-12-1	SBM-12-	DSC_1840.JPG	41.07506	-73.077957	5/24/13	SEABOSS
SBM-12-2	SBM-12-	DSC_1842.JPG	41.07513	-73.080785	5/24/13	SEABOSS
SBM-12-2	SBM-12-	DSC_1843.JPG	41.075163	-73.0808	5/24/13	SEABOSS
SBM-12-2	SBM-12-	DSC_1844.JPG	41.075195	-73.080822	5/24/13	SEABOSS
SBM-12-2	SBM-12-	DSC_1845.JPG	41.075225	-73.080855	5/24/13	SEABOSS
SBM-12-3	SBM-12-	DSC_1847.JPG	41.072027	-73.080282	5/24/13	SEABOSS
SBM-12-3	SBM-12-	DSC_1848.JPG	41.07203	-73.080277	5/24/13	SEABOSS
SBM-12-3	SBM-12-	DSC_1849.JPG	41.07204	-73.080268	5/24/13	SEABOSS
SBM-12-3	SBM-12-	DSC_1850.JPG	41.072055	-73.080257	5/24/13	SEABOSS
SBM-12-3	SBM-12-	DSC_1851.JPG	41.07207	-73.08025	5/24/13	SEABOSS
SBM-12-4	SBM-12-	DSC_1853.JPG	41.068832	-73.078308	5/24/13	SEABOSS
SBM-12-4	SBM-12-	DSC_1854.JPG	41.068808	-73.078333	5/24/13	SEABOSS
SBM-12-4	SBM-12-	DSC_1855.JPG	41.06878	-73.078367	5/24/13	SEABOSS
SBM-12-4	SBM-12-	DSC_1856.JPG	41.06871	-73.078453	5/24/13	SEABOSS
SBM-12-4	SBM-12-	DSC_1857.JPG	41.068685	-73.078485	5/24/13	SEABOSS
SBM-12-4	SBM-12-	DSC_1858.JPG	41.068655	-73.07853	5/24/13	SEABOSS
SBM-12-5	SBM-12-	DSC_1860.JPG	41.070892	-73.07672	5/24/13	SEABOSS
SBM-12-5	SBM-12-	DSC_1861.JPG	41.07089	-73.076728	5/24/13	SEABOSS
SBM-12-5	SBM-12-	DSC_1862.JPG	41.070885	-73.076738	5/24/13	SEABOSS
SBM-12-5	SBM-12-	DSC_1863.JPG	41.070882	-73.076748	5/24/13	SEABOSS
SBM-12-5	SBM-12-	DSC_1864.JPG	41.070873	-73.076775	5/24/13	SEABOSS
SBM-12-7	SBM-12-	DSC_1944.JPG	41.068483	-73.074487	5/24/13	SEABOSS
SBM-13-1	SBM-13-	DSC_1432.JPG	41.064585	-73.142297	5/23/13	SEABOSS
SBM-13-1	SBM-13-	DSC_1433.JPG	41.064652	-73.142217	5/23/13	SEABOSS
SBM-13-1	SBM-13-	DSC_1434.JPG	41.064777	-73.142058	5/23/13	SEABOSS
SBM-13-1	SBM-13-	DSC_1435.JPG	41.064873	-73.141933	5/23/13	SEABOSS
SBM-13-2	SBM-13-	DSC_1437.JPG	41.068342	-73.14092	5/23/13	SEABOSS
SBM-13-2	SBM-13-	DSC_1438.JPG	41.068428	-73.140842	5/23/13	SEABOSS
SBM-13-2	SBM-13-	DSC_1439.JPG	41.068585	-73.140672	5/23/13	SEABOSS
SBM-13-2	SBM-13-	DSC_1440.JPG	41.06867	-73.140568	5/23/13	SEABOSS
SBM-13-3	SBM-13-	DSC_1442.JPG	41.069468	-73.143467	5/23/13	SEABOSS

SBM-13-3	SBM-13-	DSC_1443.JPG	41.069555	-73.143428	5/23/13	SEABOSS
SBM-13-3	SBM-13-	DSC_1444.JPG	41.069612	-73.143398	5/23/13	SEABOSS
SBM-13-3	SBM-13-	DSC_1445.JPG	41.069697	-73.143342	5/23/13	SEABOSS
SBM-15-1	SBM-15-	DSC_1960.JPG	41.060127	-73.033837	5/24/13	SEABOSS
SBM-15-1	SBM-15-	DSC_1961.JPG	41.060053	-73.033697	5/24/13	SEABOSS
SBM-15-1	SBM-15-	DSC_1962.JPG	41.05995	-73.033537	5/24/13	SEABOSS
SBM-15-1	SBM-15-	DSC_1963.JPG	41.059857	-73.033407	5/24/13	SEABOSS
SBM-16-1	SBM-16-	DSC_1411.JPG	41.050595	-73.132263	5/23/13	SEABOSS
SBM-16-1	SBM-16-	DSC_1412.JPG	41.050673	-73.13222	5/23/13	SEABOSS
SBM-16-1	SBM-16-	DSC_1413.JPG	41.050737	-73.13219	5/23/13	SEABOSS
SBM-16-1	SBM-16-	DSC_1414.JPG	41.05079	-73.132167	5/23/13	SEABOSS
SBM-16-2	SBM-16-	DSC_1416.JPG	41.052712	-73.134943	5/23/13	SEABOSS
SBM-16-2	SBM-16-	DSC_1417.JPG	41.05276	-73.13493	5/23/13	SEABOSS
SBM-16-2	SBM-16-	DSC_1418.JPG	41.052818	-73.134907	5/23/13	SEABOSS
SBM-16-2	SBM-16-	DSC_1419.JPG	41.052878	-73.134885	5/23/13	SEABOSS
SBM-16-3	SBM-16-	DSC_1421.JPG	41.055783	-73.135108	5/23/13	SEABOSS
SBM-16-3	SBM-16-	DSC_1422.JPG	41.055812	-73.135045	5/23/13	SEABOSS
SBM-16-3	SBM-16-	DSC_1423.JPG	41.055865	-73.134933	5/23/13	SEABOSS
SBM-16-3	SBM-16-	DSC_1424.JPG	41.055912	-73.134847	5/23/13	SEABOSS
SBM-19-1	SBM-19-	DSC_1947.JPG	41.051385	-73.082163	5/24/13	SEABOSS
SBM-19-1	SBM-19-	DSC_1948.JPG	41.05134	-73.082087	5/24/13	SEABOSS
SBM-19-1	SBM-19-	DSC_1949.JPG	41.051235	-73.081895	5/24/13	SEABOSS
SBM-19-2	SBM-19-	DSC_1952.JPG	41.051162	-73.082107	5/24/13	SEABOSS
SBM-19-2	SBM-19-	DSC_1953.JPG	41.050975	-73.08181	5/24/13	SEABOSS
SBM-19-3	SBM-19-	DSC_1955.JPG	41.04643	-73.076442	5/24/13	SEABOSS
SBM-19-3	SBM-19-	DSC_1956.JPG	41.046375	-73.076307	5/24/13	SEABOSS
SBM-19-3	SBM-19-	DSC_1957.JPG	41.046288	-73.076137	5/24/13	SEABOSS
SBM-19-3	SBM-19-	DSC_1958.JPG	41.046245	-73.076047	5/24/13	SEABOSS
SBM-24-1	SBM-24-	DSC_0713.JPG	41.03461	-72.98128	5/21/13	SEABOSS
SBM-24-1	SBM-24-	DSC_0714.JPG	41.03466	-72.981235	5/21/13	SEABOSS
SBM-24-1	SBM-24-	DSC_0715.JPG	41.034732	-72.98118	5/21/13	SEABOSS
SBM-24-1	SBM-24-	DSC_0716.JPG	41.034833	-72.98112	5/21/13	SEABOSS
SBM-24-2	SBM-24-	DSC_0718.JPG	41.037272	-72.986297	5/21/13	SEABOSS
SBM-24-2	SBM-24-	DSC_0719.JPG	41.037313	-72.986335	5/21/13	SEABOSS
SBM-24-2	SBM-24-	DSC_0720.JPG	41.03739	-72.986385	5/21/13	SEABOSS
SBM-24-2	SBM-24-	DSC_0721.JPG	41.037535	-72.986445	5/21/13	SEABOSS
SBM-24-3	SBM-24-	DSC_0723.JPG	41.03957	-72.988795	5/21/13	SEABOSS
SBM-24-3	SBM-24-	DSC_0724.JPG	41.039618	-72.98882	5/21/13	SEABOSS
SBM-24-3	SBM-24-	DSC_0725.JPG	41.039707	-72.988853	5/21/13	SEABOSS
SBM-24-3	SBM-24-	DSC_0726.JPG	41.03977	-72.988867	5/21/13	SEABOSS
SBM-24-3	SBM-24-	DSC_0727.JPG	41.039823	-72.988877	5/21/13	SEABOSS
SBM-25-1	SBM-25-	DSC_1059.JPG	41.022107	-73.107578	5/22/13	SEABOSS
SBM-25-1	SBM-25-	DSC_1060.JPG	41.02212	-73.107615	5/22/13	SEABOSS
SBM-25-1	SBM-25-	DSC_1061.JPG	41.022162	-73.10772	5/22/13	SEABOSS
SBM-25-1	SBM-25-	DSC_1062.JPG	41.02218	-73.107762	5/22/13	SEABOSS

SBM-25-2	SBM-25-	DSC_1064.JPG	41.02559	-73.107232	5/22/13	SEABOSS
SBM-25-2	SBM-25-	DSC_1065.JPG	41.0255	-73.1072	5/22/13	SEABOSS
SBM-25-2	SBM-25-	DSC_1066.JPG	41.025403	-73.10718	5/22/13	SEABOSS
SBM-25-2	SBM-25-	DSC_1067.JPG	41.025305	-73.107177	5/22/13	SEABOSS
SBM-25-3	SBM-25-	DSC_1069.JPG	41.029095	-73.108213	5/22/13	SEABOSS
SBM-25-3	SBM-25-	DSC_1070.JPG	41.029048	-73.10825	5/22/13	SEABOSS
SBM-25-3	SBM-25-	DSC_1071.JPG	41.029013	-73.108278	5/22/13	SEABOSS
SBM-25-3	SBM-25-	DSC_1072.JPG	41.028967	-73.108313	5/22/13	SEABOSS
SBM-25-3	SBM-25-	DSC_1073.JPG	41.028933	-73.108338	5/22/13	SEABOSS
SBM-28-1	SBM-28-	DSC_1273.JPG	41.008845	-73.14027	5/23/13	SEABOSS
SBM-28-1	SBM-28-	DSC_1274.JPG	41.008887	-73.14032	5/23/13	SEABOSS
SBM-28-1	SBM-28-	DSC_1275.JPG	41.008923	-73.140363	5/23/13	SEABOSS
SBM-28-1	SBM-28-	DSC_1276.JPG	41.008967	-73.140413	5/23/13	SEABOSS
SBM-28-2	SBM-28-	DSC_1278.JPG	41.013658	-73.139968	5/23/13	SEABOSS
SBM-28-2	SBM-28-	DSC_1279.JPG	41.013755	-73.140145	5/23/13	SEABOSS
SBM-28-2	SBM-28-	DSC_1280.JPG	41.013793	-73.14023	5/23/13	SEABOSS
SBM-28-2	SBM-28-	DSC_1281.JPG	41.013807	-73.140255	5/23/13	SEABOSS
SBM-28-3	SBM-28-	DSC_1282.JPG	41.012722	-73.141875	5/23/13	SEABOSS
SBM-28-3	SBM-28-	DSC_1283.JPG	41.012743	-73.141883	5/23/13	SEABOSS
SBM-28-3	SBM-28-	DSC_1284.JPG	41.012778	-73.1419	5/23/13	SEABOSS
SBM-28-3	SBM-28-	DSC_1285.JPG	41.012803	-73.141913	5/23/13	SEABOSS
SBM-31-1	SBM-31-	DSC_0940.JPG	41.00646	-73.026098	5/22/13	SEABOSS
SBM-31-1	SBM-31-	DSC_0941.JPG	41.006452	-73.026037	5/22/13	SEABOSS
SBM-31-1	SBM-31-	DSC_0942.JPG	41.006435	-73.025928	5/22/13	SEABOSS
SBM-31-1	SBM-31-	DSC_0943.JPG	41.006425	-73.025868	5/22/13	SEABOSS
SBM-31-2	SBM-31-	DSC_0945.JPG	41.01198	-73.025258	5/22/13	SEABOSS
SBM-31-2	SBM-31-	DSC_0946.JPG	41.011983	-73.025208	5/22/13	SEABOSS
SBM-31-2	SBM-31-	DSC_0947.JPG	41.011982	-73.025142	5/22/13	SEABOSS
SBM-31-2	SBM-31-	DSC_0948.JPG	41.011973	-73.025043	5/22/13	SEABOSS
SBM-31-3	SBM-31-	DSC_0950.JPG	41.011807	-73.019275	5/22/13	SEABOSS
SBM-31-3	SBM-31-	DSC_0951.JPG	41.011797	-73.019225	5/22/13	SEABOSS
SBM-31-3	SBM-31-	DSC_0952.JPG	41.01178	-73.019152	5/22/13	SEABOSS
SBM-31-3	SBM-31-	DSC_0953.JPG	41.01175	-73.019027	5/22/13	SEABOSS
SBM-34-1	SBM-34-	DSC_0805.JPG	40.999527	-72.965553	5/22/13	SEABOSS
SBM-34-1	SBM-34-	DSC_0806.JPG	40.999582	-72.965743	5/22/13	SEABOSS
SBM-34-1	SBM-34-	DSC_0807.JPG	40.999615	-72.9659	5/22/13	SEABOSS
SBM-34-1	SBM-34-	DSC_0808.JPG	40.999593	-72.966017	5/22/13	SEABOSS
SBM-34-1	SBM-34-	DSC_0809.JPG	40.999592	-72.966032	5/22/13	SEABOSS
SBM-34-2	SBM-34-	DSC_0811.JPG	40.998268	-72.961093	5/22/13	SEABOSS
SBM-34-2	SBM-34-	DSC_0812.JPG	40.998258	-72.961165	5/22/13	SEABOSS
SBM-34-2	SBM-34-	DSC_0813.JPG	40.998245	-72.96124	5/22/13	SEABOSS
SBM-34-2	SBM-34-	DSC_0814.JPG	40.998235	-72.961312	5/22/13	SEABOSS
SBM-34-3	SBM-34-	DSC_0816.JPG	40.998233	-72.958378	5/22/13	SEABOSS
SBM-34-3	SBM-34-	DSC_0817.JPG	40.998267	-72.958373	5/22/13	SEABOSS
SBM-34-3	SBM-34-	DSC_0818.JPG	40.998305	-72.958415	5/22/13	SEABOSS

SBM-34-3	SBM-34-:	DSC_0819.JPG	40.998332	-72.958465	5/22/13	SEABOSS

2013 SEABOSS Video Log, May, 2013

Name2	StartLat	StartLon	EndLat	EndLong
SB-03-Track-1	41° 8.334996	-73° 5.389530	41° 8.333609	-73° 5.176784
SB-03-Track-2	41° 8.140687	-73° 5.381930	41° 8.139300	-73° 5.169194
SB-03-Track-3	41° 7.949466	-73° 5.387116	41° 7.948057	-73° 5.174442
SB-05-Track-1	41° 6.963141	-73° 7.285314	41° 6.961814	-73° 7.072639
SB-05-Track-2	41° 6.789733	-73° 7.296688	41° 6.788406	-73° 7.084022
SB-05-Track-3	41° 6.605188	-73° 7.221409	41° 6.603859	-73° 7.008754
SB-06-Track-1	41° 6.973946	-73° 4.973330	41° 6.972547	-73° 4.760658
SB-06-Track-2	41° 6.808226	-73° 5.085545	41° 6.806831	-73° 4.872882
SB-06-Track-3	41° 6.637080	-73° 5.194925	41° 6.635689	-73° 4.982270
SB-11-Track-1	41° 4.576930	-73° 6.547119	41° 4.575611	-73° 6.334658
SB-11-Track-2	41° 4.363881	-73° 6.607704	41° 4.362536	-73° 6.395170
SB-11-Track-3	41° 4.152185	-73° 6.695518	41° 4.150735	-73° 6.482889
SB-12-Track-1	41° 4.441987	-73° 4.768016	41° 4.440612	-73° 4.555565
SB-12-Track-2	41° 4.257455	-73° 4.772880	41° 4.256052	-73° 4.560354
SB-12-Track-3	41° 4.098574	-73° 4.820164	41° 4.097066	-73° 4.607540
SB-13-Track-1	41° 4.187106	-73° 8.566783	41° 4.185849	-73° 8.354340
SB-13-Track-2	41° 4.015362	-73° 8.565633	41° 4.014077	-73° 8.353114
SB-13-Track-3	41° 3.843064	-73° 8.570986	41° 3.841672	-73° 8.358371
SB-15-Track-1	41° 3.903097	-73° 1.875265	41° 3.901635	-73° 1.662848
SB-15-Track-2	41° 3.725474	-73° 1.872689	41° 3.723984	-73° 1.660195
SB-15-Track-3	41° 3.545881	-73° 1.869105	41° 3.544283	-73° 1.656516
SB-16-Track-1	41° 3.270227	-73° 8.186445	41° 3.268959	-73° 7.974052
SB-16-Track-2	41° 3.089667	-73° 8.187166	41° 3.088372	-73° 7.974698
SB-16-Track-3	41° 2.924590	-73° 8.188831	41° 2.923187	-73° 7.976266
SB-18-Track-1	41° 3.090155	-73° 6.037594	41° 3.088821	-73° 5.825214
SB-18-Track-2	41° 2.917521	-73° 5.991794	41° 2.916159	-73° 5.779338
SB-18-Track-3	41° 2.751678	-73° 6.006892	41° 2.750208	-73° 5.794339
SB-19-Track-1	41° 3.002878	-73° 4.921881	41° 3.001511	-73° 4.709507
SB-19-Track-2	41° 2.850860	-73° 4.916198	41° 2.849464	-73° 4.703747
SB-19-Track-3	41° 2.689244	-73° 4.931353	41° 2.687741	-73° 4.718805
SB-24-Track-1	41° 2.289425	-72° 59.219375	41° 2.287884	-72° 59.007049
SB-24-Track-2	41° 2.141077	-72° 59.222823	41° 2.139508	-72° 59.010419
SB-24-Track-3	41° 1.976998	-72° 59.242725	41° 1.975322	-72° 59.030224
SB-25-Track-1	41° 1.654412	-73° 6.799603	41° 1.653104	-73° 6.587299
SB-25-Track-2	41° 1.496566	-73° 6.712404	41° 1.495227	-73° 6.500023
SB-25-Track-3	41° 1.334026	-73° 6.719818	41° 1.332580	-73° 6.507339
SB-28-Track-1	41° 0.910165	-73° 8.589049	41° 0.908913	-73° 8.376782
SB-28-Track-2	41° 0.736624	-73° 8.591340	41° 0.735344	-73° 8.378997
SB-28-Track-3	41° 0.569556	-73° 8.601821	41° 0.568168	-73° 8.389381
SB-29-Track-1	41° 0.846798	-73° 7.203248	41° 0.845503	-73° 6.990987
SB-29-Track-2	41° 0.677832	-73° 7.205469	41° 0.676510	-73° 6.993132
SB-29-Track-3	41° 0.497894	-73° 7.198253	41° 0.496463	-73° 6.985819
SB-30-Track-1	41° 0.522966	-73° 5.371942	41° 0.521615	-73° 5.159701
SB-30-Track-2	41° 0.320819	-73° 5.373689	41° 0.319440	-73° 5.161373
SB-30-Track-3	41° 0.129446	-73° 5.366886	41° 0.127959	-73° 5.154475
SB-31-Track-1	41° 0.775362	-73° 1.513497	41° 0.773893	-73° 1.301248
SB-31-Track-2	41° 0.593334	-73° 1.504269	41° 0.591836	-73° 1.291945

SB-31-Track-3	41° 0.412368	-73° 1.504138	41° 0.410763	-73° 1.291718
SB-33-Track-1	40° 59.88891	-73° 7.601164	40° 59.887638	-73° 7.388953
SB-33-Track-2	40° 59.72741	-73° 7.724061	40° 59.726113	-73° 7.511773
SB-33-Track-3	40° 59.52904	-73° 7.836499	40° 59.527636	-73° 7.624116
SB-34-Track-1	41° 0.113477	-72° 57.699956	41° 0.111892	-72° 57.487749
SB-34-Track-2	40° 59.96794	-72° 57.617110	40° 59.966325	-72° 57.404825
SB-34-Track-3	40° 59.79466	-72° 57.647492	40° 59.792943	-72° 57.435111

2013 K2 ROV Summary Log, May, 2013

Dive #	Sampling Block	Start Lat	Start Long	End Lat	End Long
01	SB-05	N41 06.7897	W073 07.2708	N41 06.7851	W073 07.2338
02	SB-11	N41 04.5842	W073 06.5269	N41 04.5768	W073 06.3338
03	SB-21	N41 02.1899	W073 06.6202	N41 02.3319	W073 06.5640
04	SB-08	N41 05.1449	W073 06.0633	N41 05.3251	W073 06.0811
05	SB-08	N41 05.0782	W073 06.1549	N41 04.9460	W073 06.1349
06	SB-21	N41 02.3212	W073 06.5571	N41 02.4365	W073 06.4949
07	SB-12	N41 04.4813	W073 04.6520	N41 04.4265	W073 04.6594
08	SB-06	N41 06.5476	W073 05.1526	N41 06.5363	W073 05.1221
					Total

Hours HD video (approx)	# Still images	Comments
2.5		Sand wave forms
2		Crepidula mound area, few mounds seen
2.25		Boulder ridge
1.5		transit up northern wall of cut
2.5		transit up southern wall of cut
2		Boulder ridge
3.5		Boulder area
2.5		Transects on and 50m off pipeline trench
18.75	1310	

Appendix 6: Physical Oceanographic Cruise Details

LISMARC Summary Log of Seafloor Frame Locations

PolygonID	Sampling Block	Sample #	DDM Lat	DDM Lon	Latitude	Longitude
1	SB-06	6	41 06.77951N	073 04.96170W	41 06.805N	073 04.956W
1	SB-04	3	41 07.31557N	073 08.04942W	41 07.311N	073 08.089W
2	SB-11	1	41 04.25308N	073 06.41018W	41 04.258N	073 06.395W
2	SB-18	2	41 03.05745N	073 05.82326W	41 03.153N	073 05.805W
2	SB-33	2	40 59.83400N	073 07.60927W	40 59.759N	073 07.571W

Time Period	Duration (days)	Depth (m)	ADCP/Waves	Temp/Sal	AQD HR
2012, Dec 7-20	13	14.6	YES	YES	YES
2012-2013, Dec 20 - Jan 11	22	8.0	YES	YES	NO
2013, Jan 11-15	4	16.7	YES	YES	YES
2013, Feb 26 - Apr 10	44	18.5	YES	YES	YES
2013, Apr 10 - May 9	30	22.5	YES	YES	YES

LISMARC Summary Log of ADCP Sampling

PolygonID	Sampling Block	Sample #	DDM Lat	DDM Lon
1	SB-03	2	41 08.05492N	073 05.42561W
1	SB-06	6	41 06.77951N	073 04.96170W
1	SB-09	2	41 05.07053N	073 04.20707W
1	SB-10	2	41 04.91242N	073 08.05659W
1	SB-04	3	41 07.31557N	073 08.04942W
2	SB-11	1	41 04.25308N	073 06.41018W
2	SB-18	2	41 03.05745N	073 05.82326W
2	SB-25	3	41 01.50310N	073 06.81304W
2	SB-33	2	40 59.83400N	073 07.60927W
2	SB-13	3	41 04.01255N	073 08.41581W
3	SB-12	2	41 04.29056N	073 04.60809W
3	SB-15	3	41 03.66076N	073 01.87293W
3	SB-26	2	41 01.47613N	073 02.07550W
3	SB-30	1	41 00.17263N	073 05.17984W
3	SB-19	2	41 02.78168N	073 04.76100W
4	SB-20	2	41 02.77703N	073 00.99047W
4	SB-24	3	41 02.10744N	072 59.21174W
4	SB-34	3	41 00.01847N	072 57.73209W
4	SB-31	3	41 00.61058N	073 01.44413W

Appendix 7: Data Products Inventory

Extract of data sets from the Long Island Sound Data Portal (http://www.marine-geo.org/portals/lis/) hosted as part of the Interdisciplinary Earth Data Alliance (IDEA) at Lamont-Doherty Earth Observatory of Coulmbia University
Visit http://www.marine-geo.org/tools/new_search/index.php?&a=1&funding=LISS&output_info_all=on for more information and to access data.

Entry_id	Data Set	Investigator	Date Range	Platform
LIS:Epifauna	Biology:Species:Abundance, Biology:Species:Distribution	Auster	;;	NotApplicable
LIS:Epifauna	Biology:Species:Abundance, Biology:Species:Distribution	Auster	;;	NotApplicable
LIS:FVCOM	BottomStress, Salinity, Temperature	O'Donnell, Fake	;;	NotApplicable
LIS:NOAA_Acoustics	Backscatter:Acoustic	Battista	;;	NotApplicable
LIS:NOAA_Acoustics	Backscatter:Acoustic, Bathymetry	Battista	;;	NotApplicable
LIS:NOAA_Acoustics	Backscatter:Acoustic, Bathymetry, Bathymetry:BPI, Sidescan	Battista	;;	NotProvided
LIS:NOAA_Acoustics	Backscatter:Acoustic, Bathymetry, Sidescan	Battista	;;	NotApplicable
LIS:NOAA_Acoustics	Backscatter:Acoustic, Bathymetry:BPI, Sidescan	Battista	;;	NotApplicable
LIS:NOAA_Acoustics	Bathymetry:Swath	Beaver	;;	Rude
LIS:NOAA_Acoustics	Documentation	Battista	;;	Thomas Jefferson
LIS:Sediments	Interpretation:Geologic	Nitsche, Kenna, McHugh	;;	NotApplicable
LIS:Sediments	Interpretation:Geologic	Kenna, McHugh, Nitsche	;;	NotApplicable
LIS:Sediments	Interpretation:Geologic	Kenna, McHugh, Nitsche	;;	NotApplicable
LIS:Sediments	Interpretation:Geologic	Kenna, McHugh, Nitsche	;;	NotApplicable
LIS:Sediments	Interpretation:Geologic:Map	Kenna, Nitsche, McHugh	;;	NotApplicable
LIS:Sediments	Interpretation:Geologic:SedimentaryEnvironments	Kenna, McHugh, Nitsche	;;	NotApplicable
LIS:Sediments	Interpretation:Geologic:SedimentaryEnvironments	Nitsche	;;	NotApplicable
LIS:SOMAS_Biology	Biology:Species:Abundance, Biology:Species:List	Cerrato	2013-06-01;;2013-09-11	NotProvided
LIS:SOMAS_Biology	SampleInfo:Biology	Cerrato	2013-06-01;;2013-09-11	NotApplicable
LIS:URI	Bathymetry, Sidescan	King	;;	Shanna Rose
LIS:URI	Bathymetry, Sidescan	King	;;	Shanna Rose
LIS1201	Seismic:Active:Subbottom	Nitsche	2012-06-04;;2012-06-05	Pritchard
LIS1201	Seismic:Navigation	Nitsche	2012-06-04;;2012-06-05	Pritchard
LIS1301	Backscatter:Acoustic, Bathymetry:Swath	Flood	2013-03-18;;2013-03-30	Seawolf
LIS1301	Seismic:Active:Subbottom	Nitsche	2013-03-18;;2013-03-30	Seawolf
LIS1301	Seismic:Navigation	Nitsche	2013-03-18;;2013-03-30	Seawolf
LIS1302	Seismic:Active:Subbottom	Nitsche	2013-04-16;;2013-04-25	Pritchard
LIS1302	Seismic:Navigation	Nitsche	2013-04-16;;2013-04-25	Pritchard
LIS1303	Chemistry:Sediment, Sediment:Description	Nitsche, McHugh, Kenna	2013-06-05;;2013-06-13	Seawolf
LIS1303	Chemistry:Sediment, Sediment:Description	Kenna, McHugh, Nitsche	2013-06-05;;2013-06-13	Seawolf
LIS1303	Navigation:Primary	Nitsche, Kenna, McHugh	2013-06-05;;2013-06-13	Seawolf
LIS1303	Photograph	Kenna, Nitsche, McHugh	2013-06-05;;2013-06-13	Seawolf
LIS1303	Photograph	Nitsche, McHugh, Kenna	2013-06-05;;2013-06-13	Seawolf
LIS1303	Photograph, Sediment:Description	Nitsche, McHugh, Kenna	2013-06-05;;2013-06-13	Seawolf
LIS1303	PhysicalDescription	Nitsche	2013-06-05;;2013-06-13	Seawolf
LIS1303	PhysicalProperties:Sediment	Nitsche, McHugh, Kenna	2013-06-05;;2013-06-13	Seawolf
LIS1303	SampleInfo	Nitsche, Kenna, McHugh	2013-06-05;;2013-06-13	Seawolf
LIS1303	SampleInfo:Sediment	Nitsche, Kenna, McHugh	2013-06-05;;2013-06-13	Seawolf
LIS1303	SampleInfo:Sediment	Kenna, Nitsche, McHugh	2013-06-05;;2013-06-13	Seawolf
LIS1303	Sediment:Description	Nitsche, McHugh, Kenna	2013-06-05;;2013-06-13	Seawolf
LIS1303	Sediment:Description	Kenna, McHugh, Nitsche	2013-06-05;;2013-06-13	Seawolf
LIS1303	Sediment:Description	Nitsche, McHugh, Kenna	2013-06-05;;2013-06-13	Seawolf
LIS1304	Backscatter:Acoustic, Bathymetry:Swath	Flood	2013-08-29;;2013-09-18	Pritchard
LIS1304	Sidescan	Flood	2013-08-29;;2013-09-18	Pritchard
LISMARC:PO	Navigation, SampleInfo	O'Donnell	2013-06-01;;2013-06-02	Connecticut
LISMARC12:ISIS	Navigation	Auster	2013-12-10;;2013-12-12	NotProvided
LISMARC12:ISIS	Photograph	Auster, Stefaniak	2013-12-10;;2013-12-12	Isis
LISMARC12:SEABOSS	Biology:Species:Abundance, Biology:Species:Distribution	Zajac	2012-10-10;;2012-10-19	SEABOSS
LISMARC12:SEABOSS	Biology:Species:Abundance, Biology:Species:Distribution	Zajac	2012-10-10;;2012-10-19	SEABOSS
LISMARC12:SEABOSS	Documentation, SampleInfo	Poppe, Zajac	2012-10-10;;2012-10-19	SEABOSS
LISMARC12:SEABOSS	Navigation	Poppe, Zajac	2012-10-10;;2012-10-19	SEABOSS
LISMARC12:SEABOSS	Navigation	Zajac	2012-10-10;;2012-10-19	SEABOSS
LISMARC12:SEABOSS	Photograph	Zajac, Poppe	2012-10-10;;2012-10-19	SEABOSS
LISMARC12:SEABOSS	SampleInfo, Sediment:Description	Poppe	2012-10-10;;2012-10-19	SEABOSS
LISMARC13:ROV	Photograph	Auster, Stefaniak	2013-05-13;;2013-05-16	Kraken2
LISMARC13:SEABOSS	Documentation, SampleInfo	Poppe, Zajac	2013-05-20;;2013-05-25	SEABOSS
LISMARC13:SEABOSS	Navigation	Zajac	2013-05-20;;2013-05-25	NotProvided
LISMARC13:SEABOSS	Navigation	Poppe	2013-05-20;;2013-05-25	SEABOSS
LISMARC13:SEABOSS	Navigation	Zajac	2013-05-20;;2013-05-25	SEABOSS
LISMARC13:SEABOSS	Photograph	Zajac, Auster, Poppe, Stefaniak	2013-05-20;;2013-05-25	SEABOSS
LISMARC13:SEABOSS	SampleInfo, Sediment:Description	Poppe	2013-05-20;;2013-05-25	SEABOSS

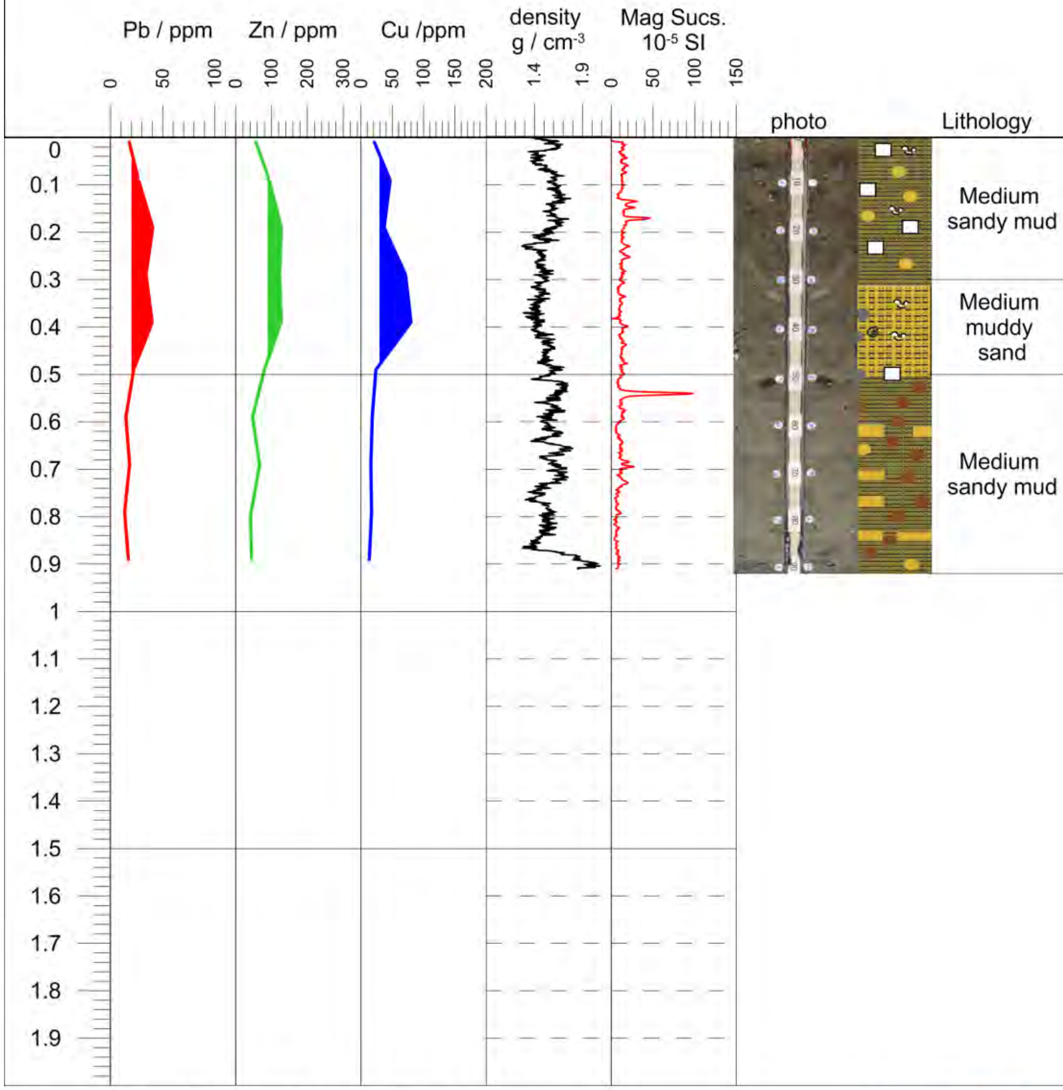
Appendix 8: Sediment Core Logs and Descriptions

APPENDIX 8 – Sediment Core Log Data

As part of the pilot of the Long Island Sound mapping project LDEO collected 46 sediment cores. The main text (section 4.4) describes the details of the core analysis and presents examples of the findings of the sediment cores. In this appendix we present the descriptions, photos and the most important log data next to each other. Plots have been generated using the Strater software program. The plots show metal content derived from X-Ray Fluorescence measurements (Lead/Pb, zinc/Zn, Copper/Cu with filled graphs for values above background), density, magnetic susceptibility, core photograph, as well as drawing and text description of lithology.

core ID: **GC01**

Location 40.99222 N
73.0925 W



Description

0-30 cm, heavily bioturbated (10Y3/1), with small (mm scale)shell fragments and floating lithic clasts. The lithic clasts are at 1, 13, 20, 27 cm, subrounded to subangular, mm's to 1 cm long (gray, beige, white).

30- 50 cm, heavily bioturbated (10Y2.5/1) with floating clay cats, lithic clasts, shells and shell fragments. Gastropod shell 2 cm long at 40 cm. This interval contains fewer lithic clasts than 0-39 cm above. 35 cm, more clay clasts. 40 cm, more clay clasts, 50 cm, more clay clasts

heavily bioturbated (10Y3/1) sandy mud with coarse grained sand beds, lenses and laminae up to 4 cm thick. Sand is coarse grained and contains shell fragments. The heavy bioturbation cross-cuts the sand beds.

depth / m
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9

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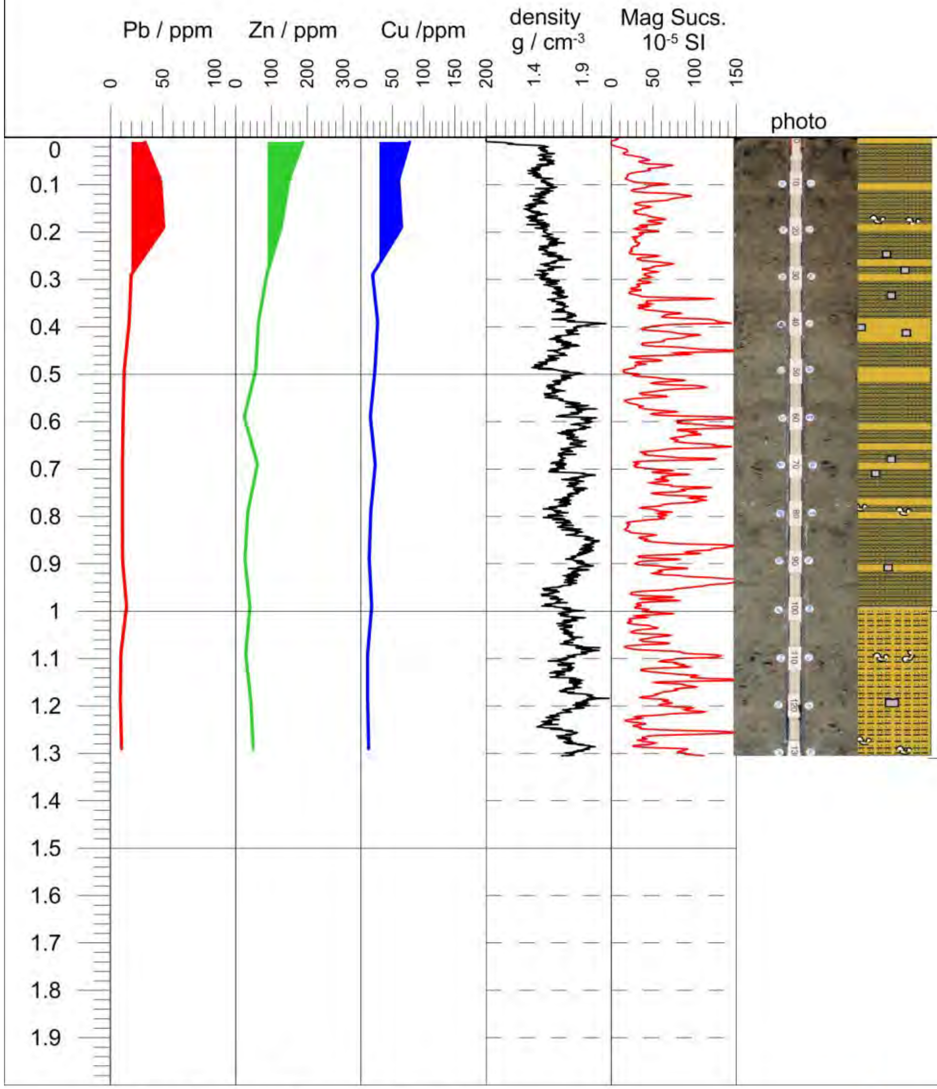
Lamont-Doherty Earth Observatory
COLUMBIA UNIVERSITY | EARTH INSTITUTE

Queens College
CITY UNIVERSITY OF NEW YORK

core ID: **GC02**

Location 41.02052 N
73.12937 W



Lithology	Description
Interbedded sand beds and mud	0-2 cm, coarse sand beds. Contains shells and fragments up to 1.5 cm long, 10-11 cm, coarse sand beds. Contains shells and fragments up to 1.5 cm long. 18-19 cm, Coarse sand beds. Contains shells and fragments up to 1.5 cm long. 26-28 cm, contains several lithic clasts: 1 cm long, subrounded and angular. 34-36 cm, 1.5 cm long subrounded lithic clast. 38-44 cm, coarse sand bed with lithic clasts. 49-52 cm, coarse sand. 56-60 cm, coarse sand lenses., 63-66 cm, coarse sand bed with lithic clast. 69-72 cm, coarse sand bed with angular lithic clasts. 78-80 cm, coarse sand bed, shells some intact with two valves (clam) few shell fragments. 85-90 cm, coarse sand lense. 91-93 cm, coarse sand bed and lithic clast 0.5 cm long,
Interbedded coarse sand and sandy mud	100-131.5 cm, interbedded coarse sand and sandy mud. 110 cm, scattered red shells. 120 cm, 1 cm long angular lithic clast. 128 cm, shell fragments

depth / m: 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9

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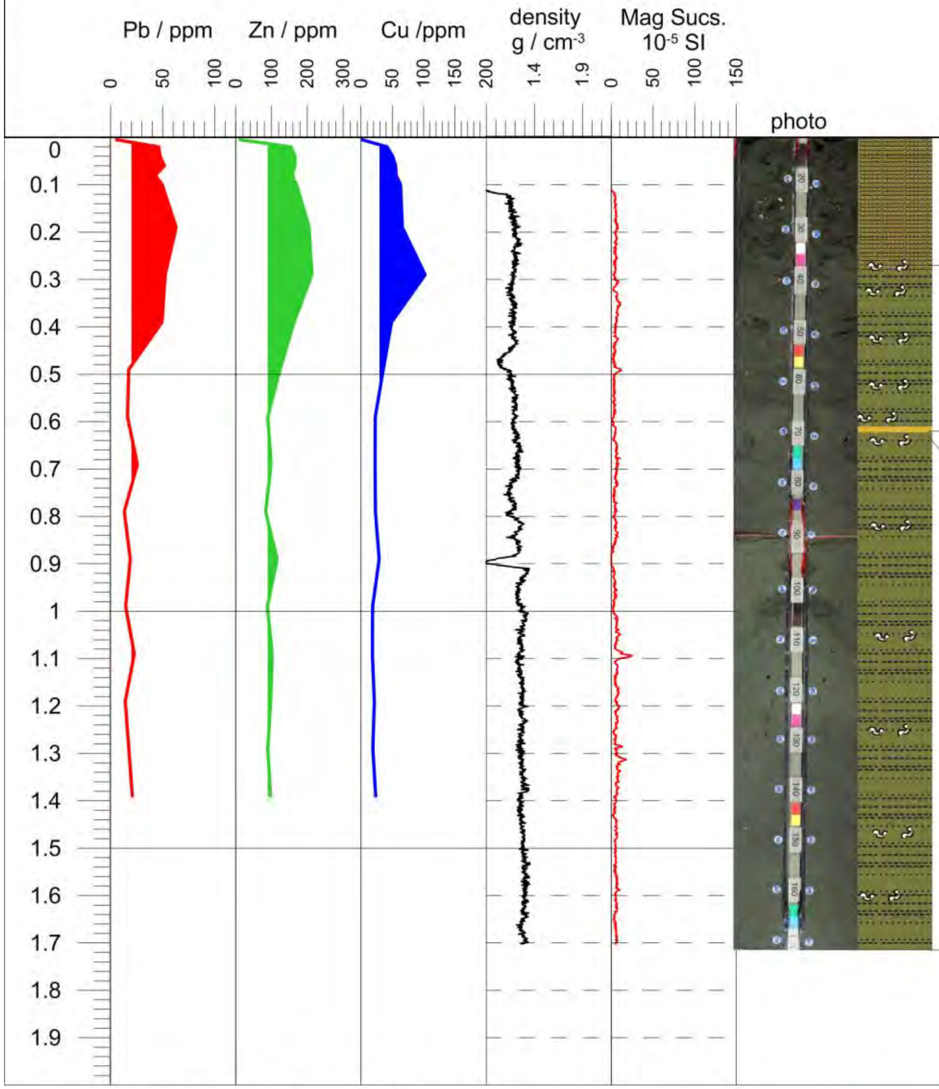
Queens College
CITY UNIVERSITY OF NEW YORK

core ID: **GC03**

Location 41.03588 N
73.15472 W



Lithology	Description
Sandy mud	0-27 cm, sandy mud with pockets of shells and shell fragments: 24 - 27 cm.
Mud	27 - 62 cm, mud with scattered shells at: 33 cm, 42 cm, 50 cm, 55 cm, 58 cm,
Sand	62-63 cm, sand bed.
Mud	63-171 cm, mud with scattered shells at 63 cm, 83 cm, 105 cm, 125 cm, 160 cm. The core is mottled due to heavy bioturbation.

depth / m

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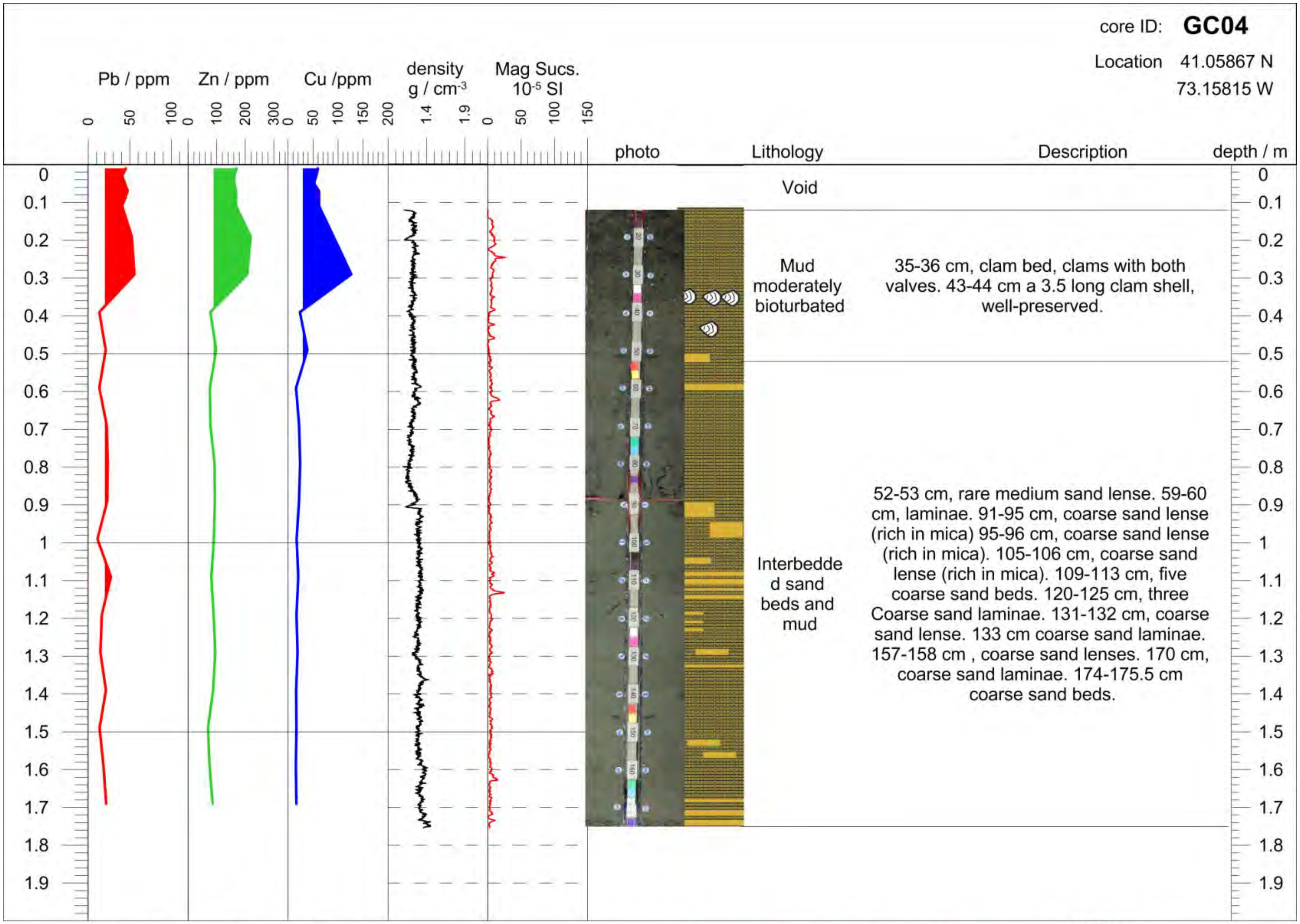
Queens College
City University of New York

core ID: **GC04**

Location 41.05867 N
73.15815 W



35-36 cm, clam bed, clams with both valves. 43-44 cm a 3.5 long clam shell, well-preserved.

52-53 cm, rare medium sand lense. 59-60 cm, laminae. 91-95 cm, coarse sand lense (rich in mica) 95-96 cm, coarse sand lense (rich in mica). 105-106 cm, coarse sand lense (rich in mica). 109-113 cm, five coarse sand beds. 120-125 cm, three Coarse sand laminae. 131-132 cm, coarse sand lense. 133 cm coarse sand laminae. 157-158 cm , coarse sand lenses. 170 cm, coarse sand laminae. 174-175.5 cm coarse sand beds.

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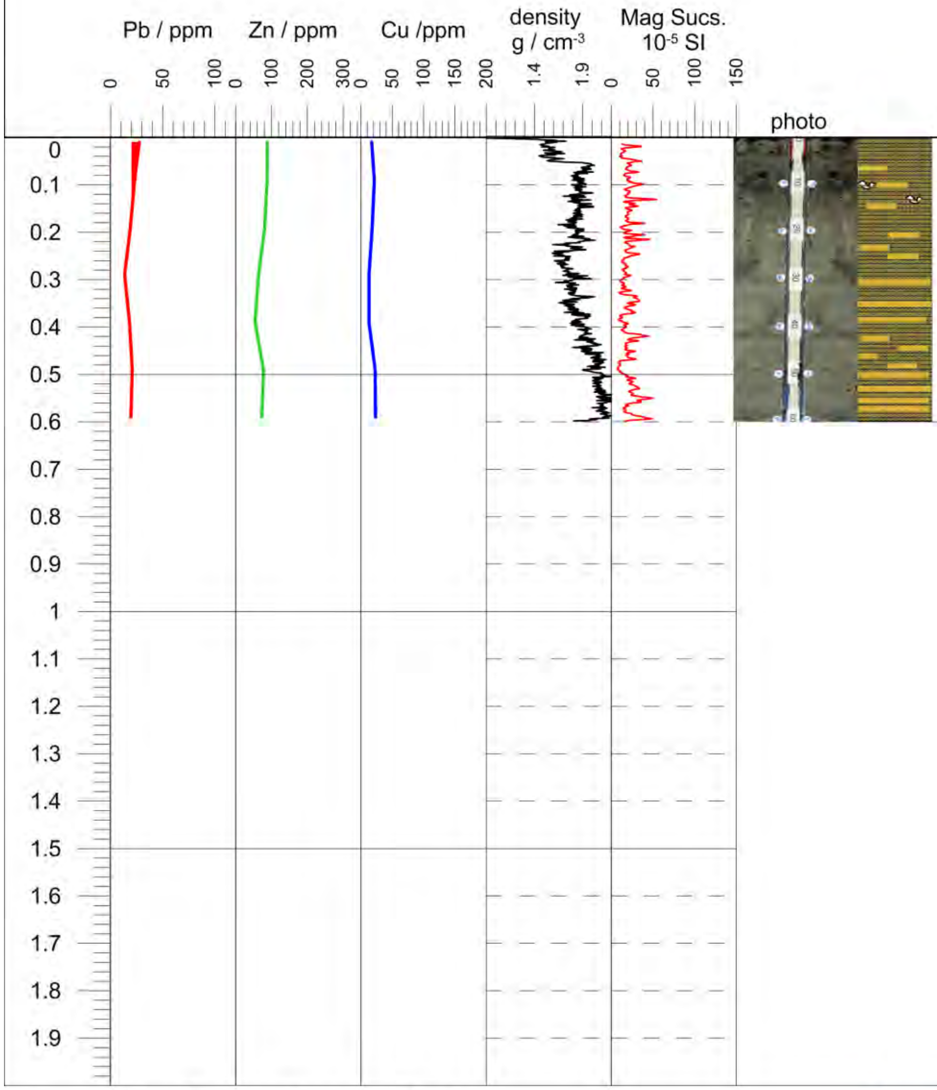
core ID: **GC05**

Location 41.0503 N
73.13915 W



Lithology	Description	depth / m
Micaceous, coarse sandy mud interbedded with sand beds and lenses	Sand bed and lenses common. 7-8 cm, lenses. 10-11 cm, lenses. 11 cm, Rare scattered shell fragments. 13 cm, Rare scattered shell fragments. 14-15 cm, lenses. 20-21 cm, lenses. 23-24 cm, lenses. 26-27 cm, lenses. 44-50 cm, lenses. 30-31 cm, beds. 35-36 cm, beds. 50-60 cm, beds. 40-44 cm laminae. Rare scattered shell fragments	0–0.6

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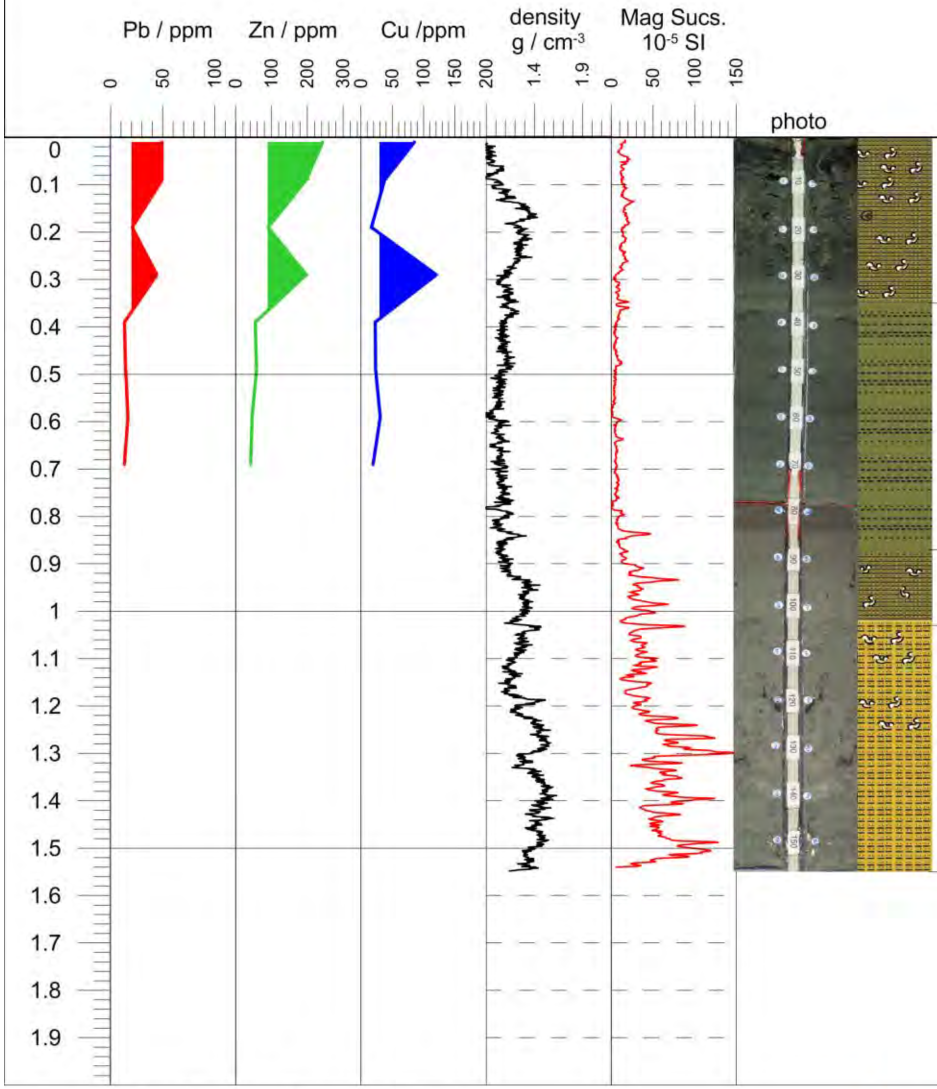
core ID: **GC06**

Location 41.08022 N
73.12578 W



Lithology	Description
Shelly sandy mud	Contains shell fragments (mm-scale) and shells. There is a 2 cm long mussel shell. 18-35 cm, shelly mud with shell fragments decreasing in abundance towards 35 cm beds and lenses. 147-153 cm a gastropod shell fragment.
Homogeneous mud	35-87 cm, homogenous mud.
Shelly sandy mud	87-103 cm, shelly sandy mud. Shells are mostly fragments and constitute ~10% of the interval.
Shelly muddy sand	103-110 cm, coarse sand beds. 110-123 cm Sandy mud with scattered shells and fragments. 117-118 cm a clam shell well-preserved. 123-155

depth / m

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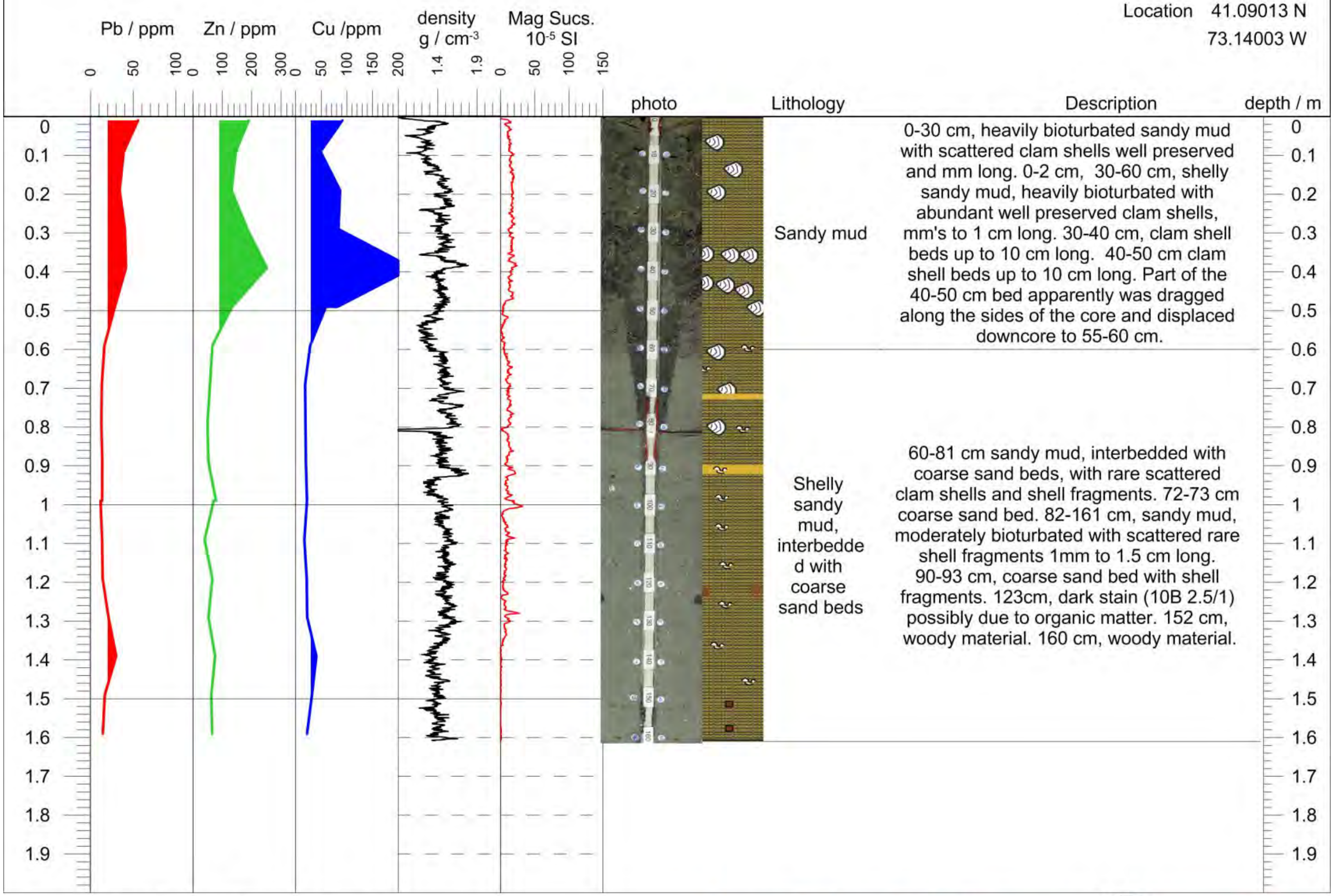
core ID: **GC07**

Location 41.09013 N
73.14003 W



0-30 cm, heavily bioturbated sandy mud with scattered clam shells well preserved and mm long. 0-2 cm, 30-60 cm, shelly sandy mud, heavily bioturbated with abundant well preserved clam shells, mm's to 1 cm long. 30-40 cm, clam shell beds up to 10 cm long. 40-50 cm clam shell beds up to 10 cm long. Part of the 40-50 cm bed apparently was dragged along the sides of the core and displaced downcore to 55-60 cm.

60-81 cm sandy mud, interbedded with coarse sand beds, with rare scattered clam shells and shell fragments. 72-73 cm coarse sand bed. 82-161 cm, sandy mud, moderately bioturbated with scattered rare shell fragments 1mm to 1.5 cm long. 90-93 cm, coarse sand bed with shell fragments. 123cm, dark stain (10B 2.5/1) possibly due to organic matter. 152 cm, woody material. 160 cm, woody material.

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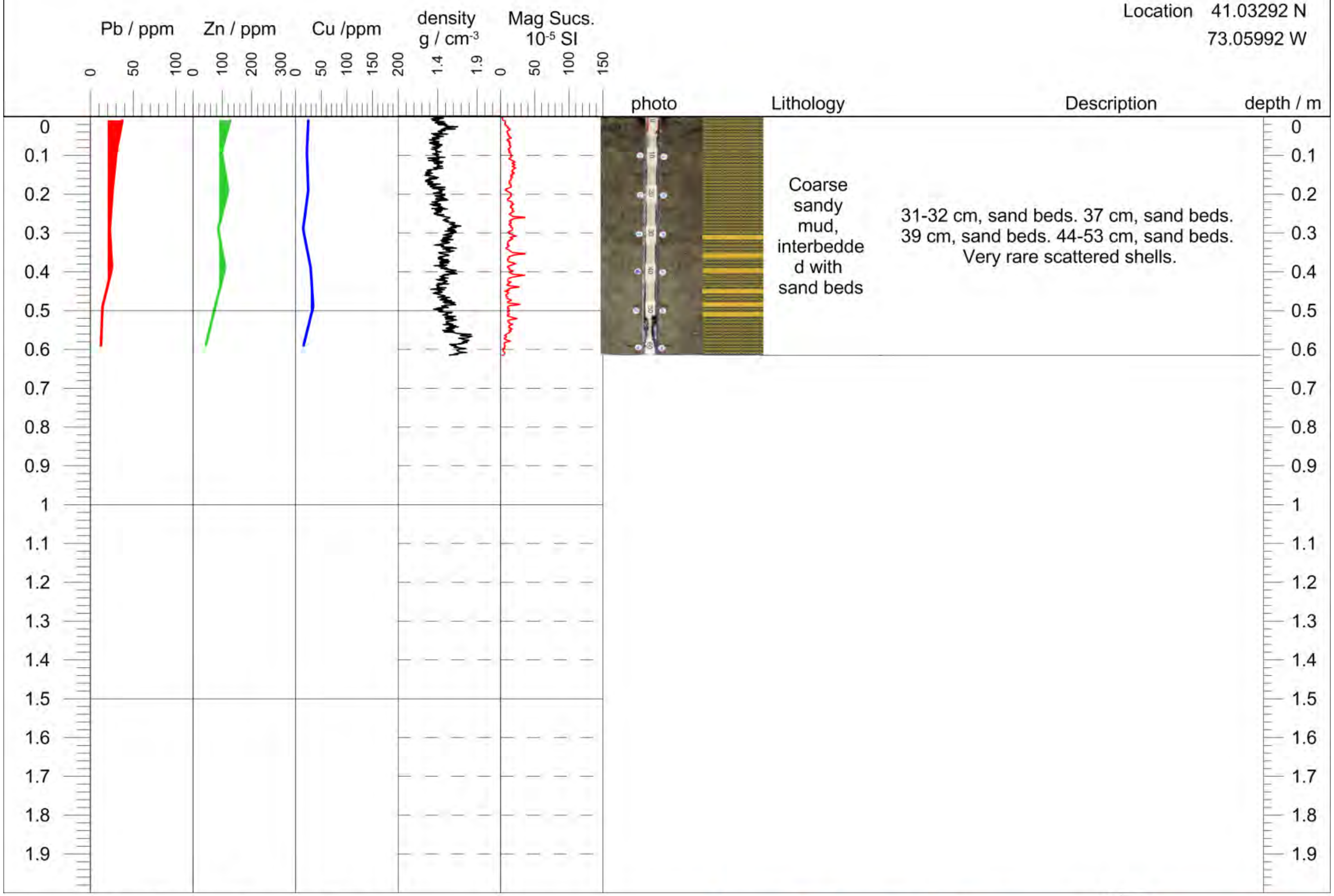
core ID: **GC08**

Location 41.03292 N
73.05992 W



Coarse sandy mud, interbedded with sand beds

31-32 cm, sand beds. 37 cm, sand beds. 39 cm, sand beds. 44-53 cm, sand beds. Very rare scattered shells.

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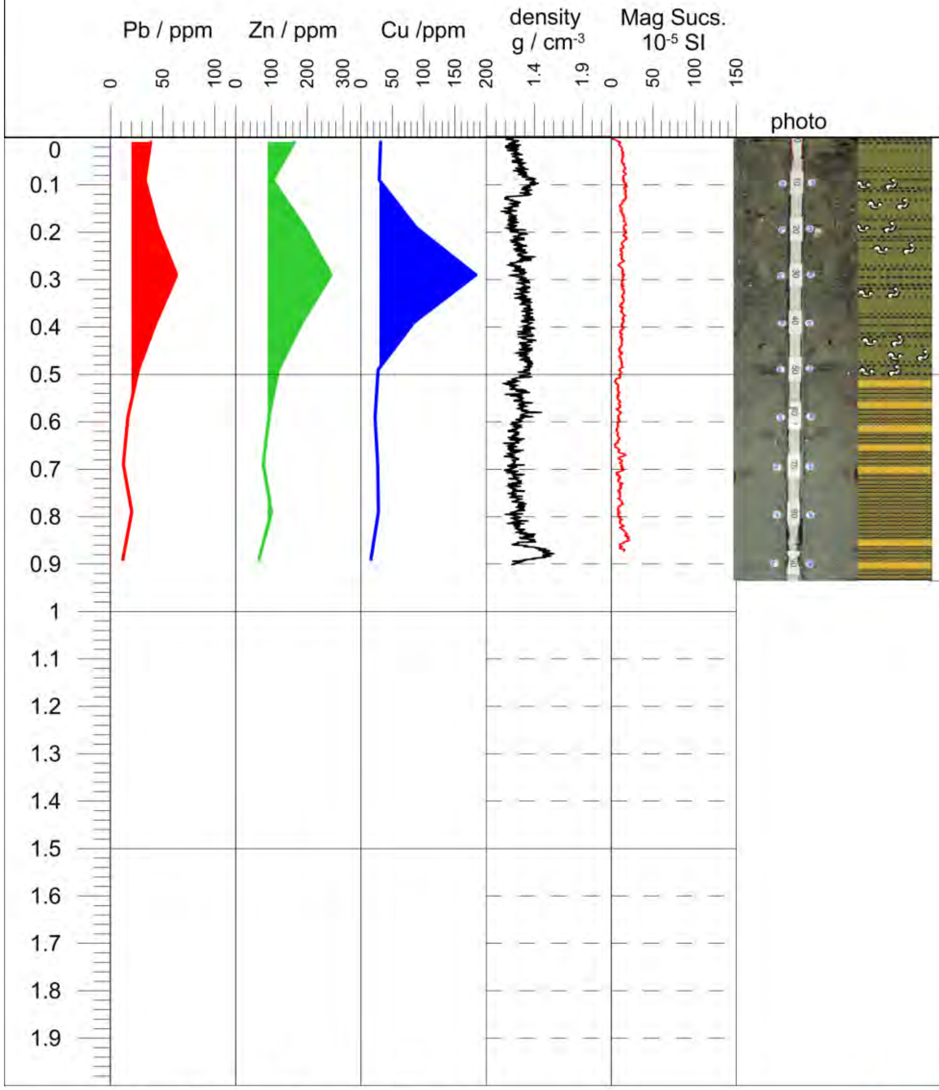
core ID: **GC09**

Location 41.09653 N
73.05067 W



Lithology	Description	depth / m
Mud with scattered shell fragments	0-9 cm, mud. 9-33 cm, mud with scattered shell fragments up to 2 cm long. 45-50 cm, mud with scattered shell fragments, mm-long.	0 – 0.5
Sandy mud with coarse sand beds and lenses	50-93.5 cm, coarse sand beds and lenses.	0.5 – 0.9

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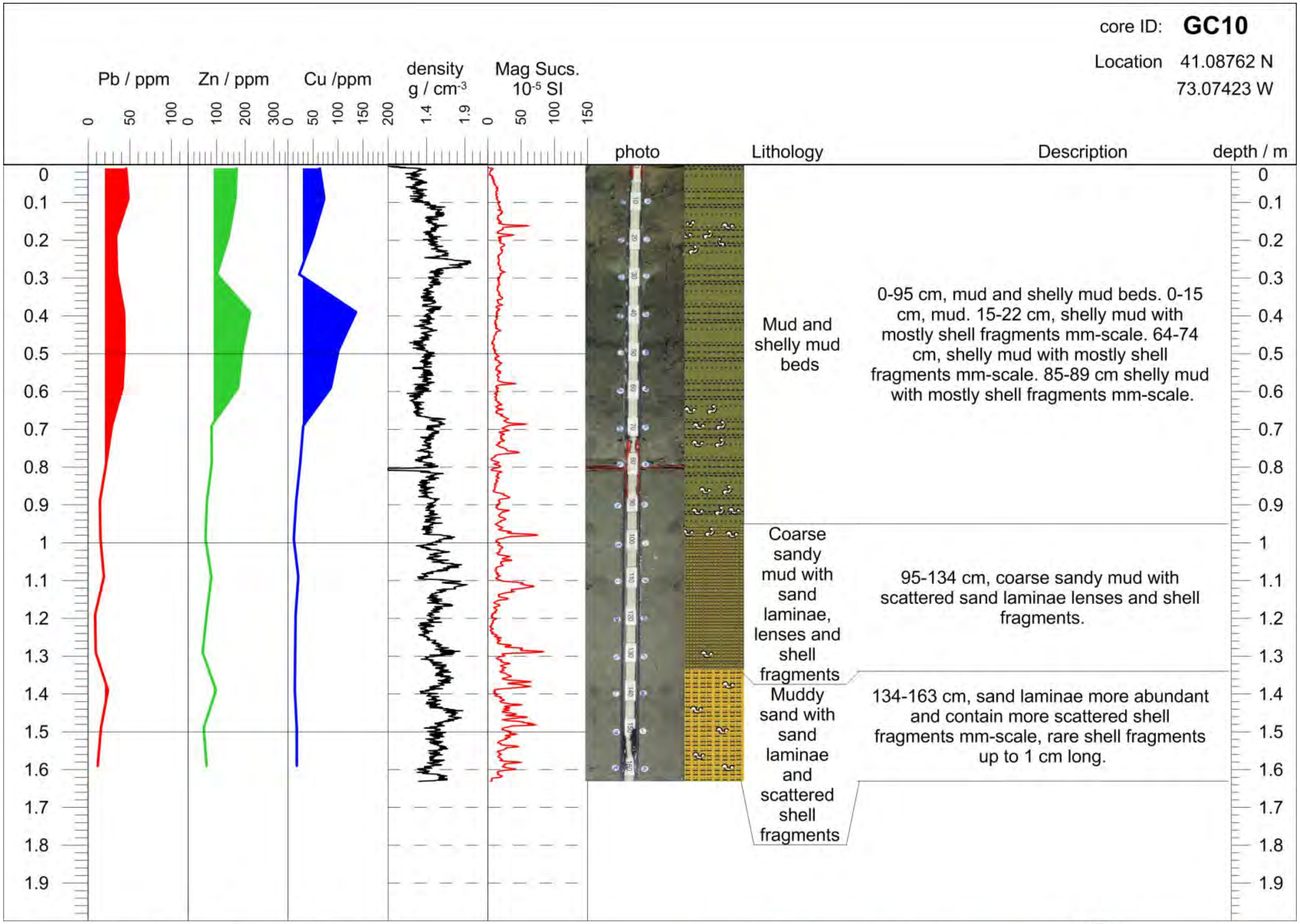
core ID: **GC10**

Location 41.08762 N
73.07423 W



0-95 cm, mud and shelly mud beds. 0-15 cm, mud. 15-22 cm, shelly mud with mostly shell fragments mm-scale. 64-74 cm, shelly mud with mostly shell fragments mm-scale. 85-89 cm shelly mud with mostly shell fragments mm-scale.

95-134 cm, coarse sandy mud with scattered sand laminae lenses and shell fragments.

134-163 cm, sand laminae more abundant and contain more scattered shell fragments mm-scale, rare shell fragments up to 1 cm long.

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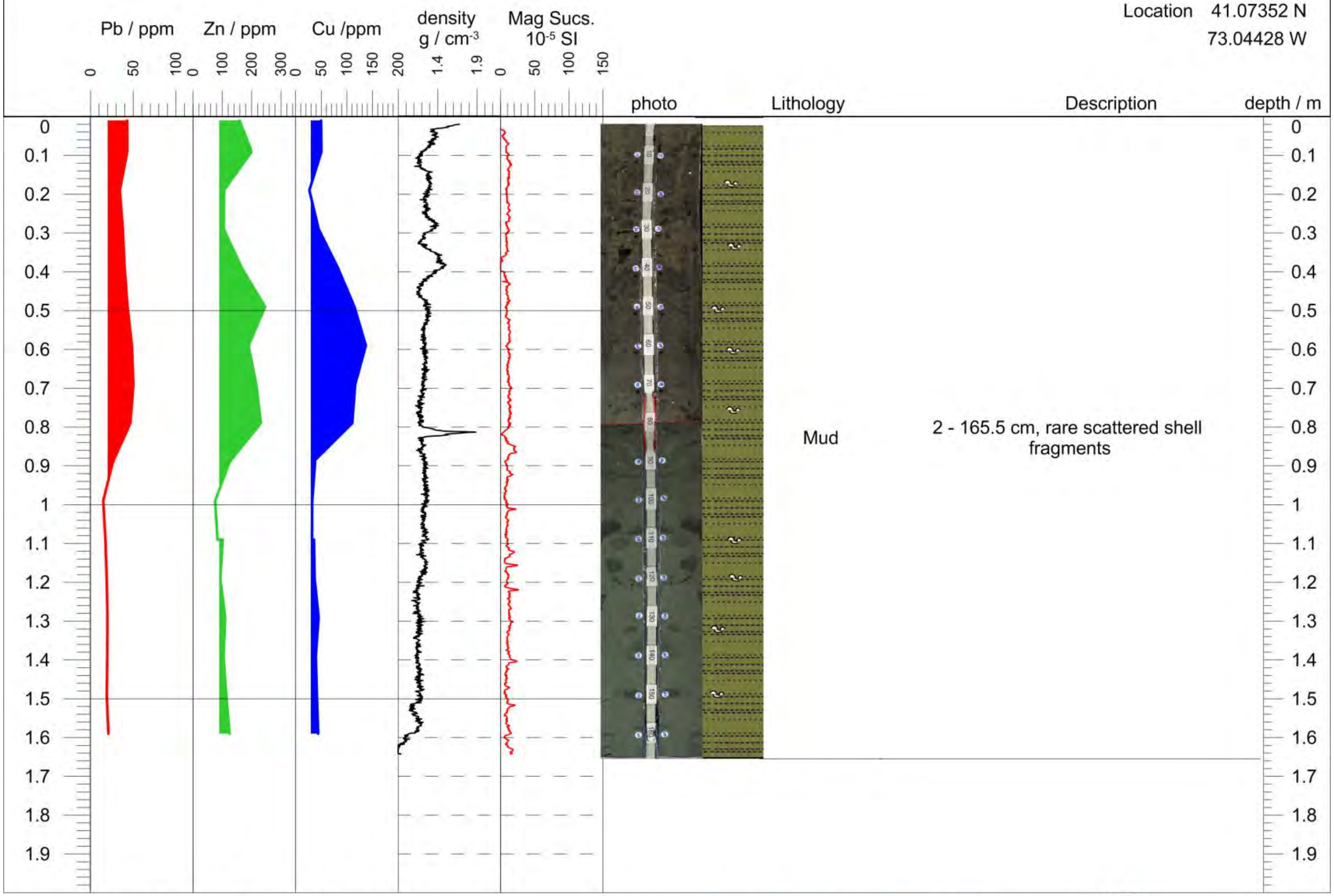
core ID: **GC11**

Location 41.07352 N
73.04428 W



2 - 165.5 cm, rare scattered shell fragments

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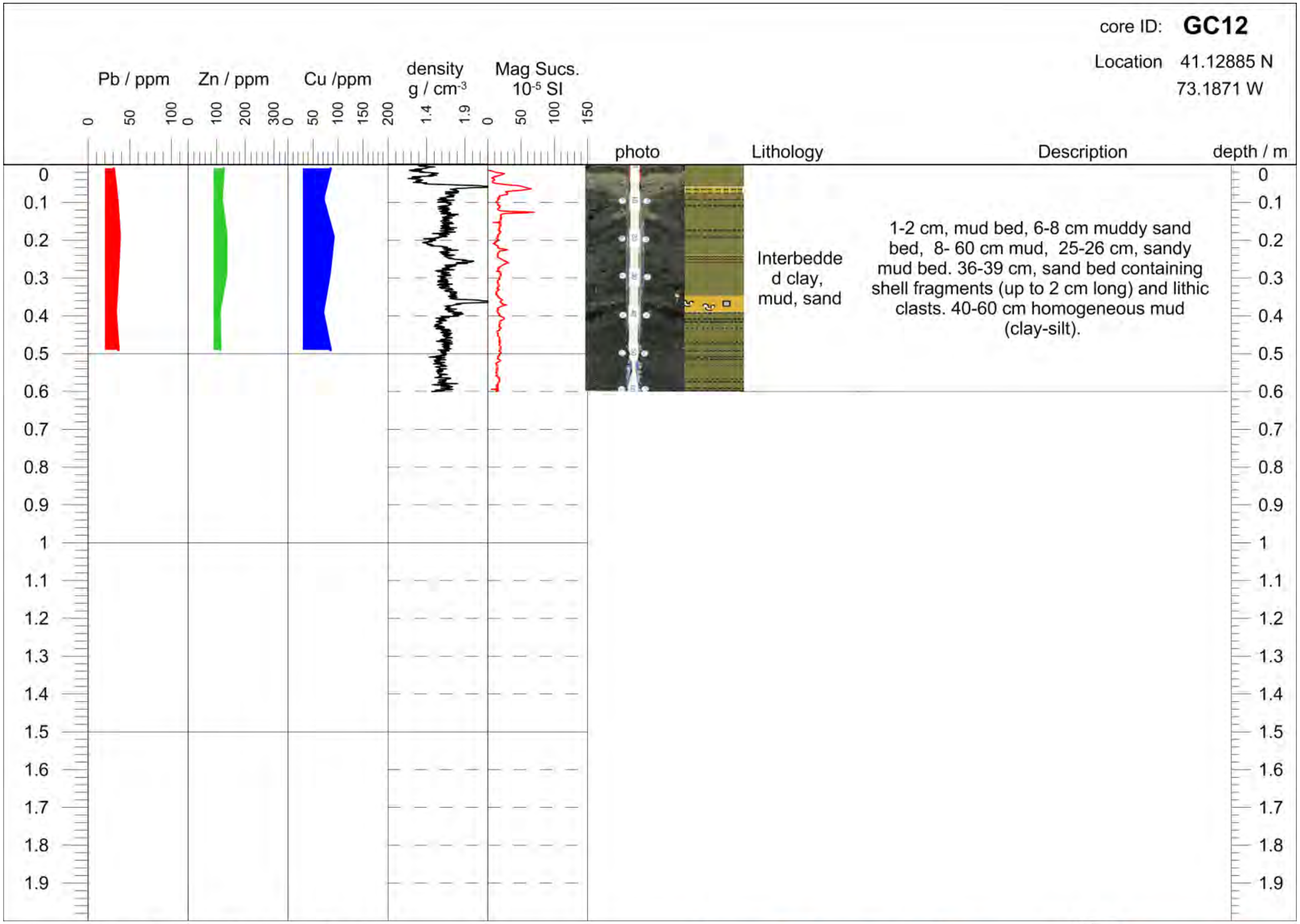
core ID: **GC12**

Location 41.12885 N
73.1871 W



1-2 cm, mud bed, 6-8 cm muddy sand bed, 8- 60 cm mud, 25-26 cm, sandy mud bed. 36-39 cm, sand bed containing shell fragments (up to 2 cm long) and lithic clasts. 40-60 cm homogeneous mud (clay-silt).

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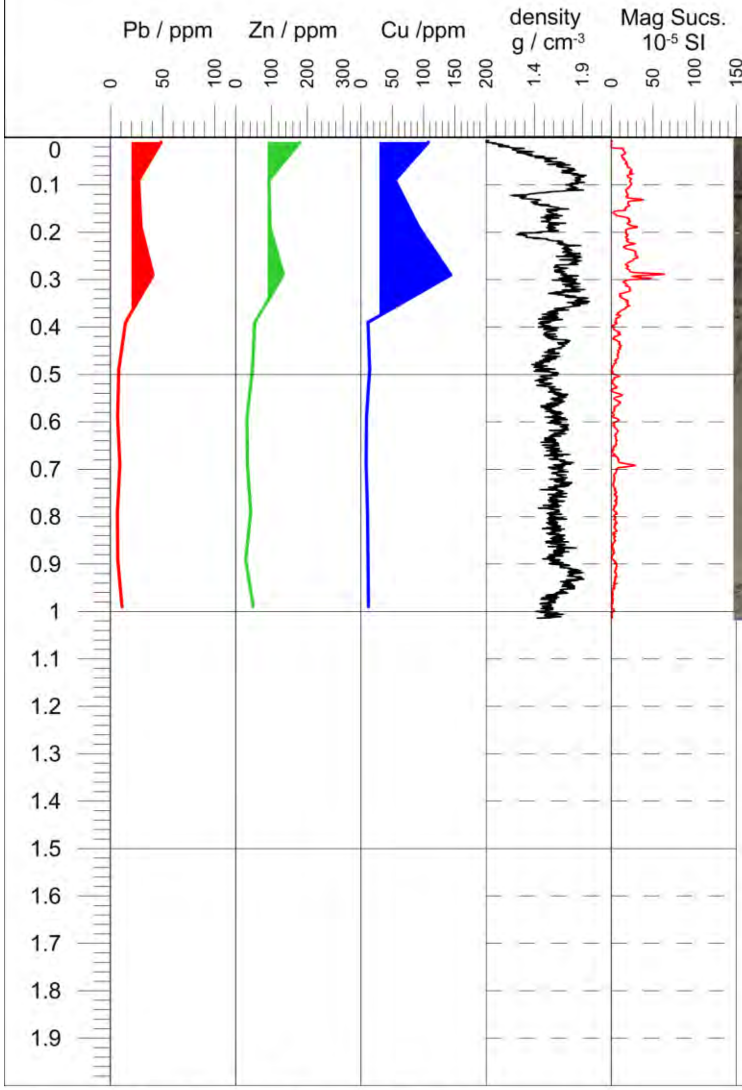
core ID: **GC13**

Location 41.10888 N
73.16588 W



Lithology	Description
Mud	0-8 cm, mud.
Shelly mud	8-30 cm, mud with abundant clam shells and fragments. Most well-preserved and mm to 1 cm long. Mullimina sp.
Mud	30-102 cm, homogeneous mud.

depth / m
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9

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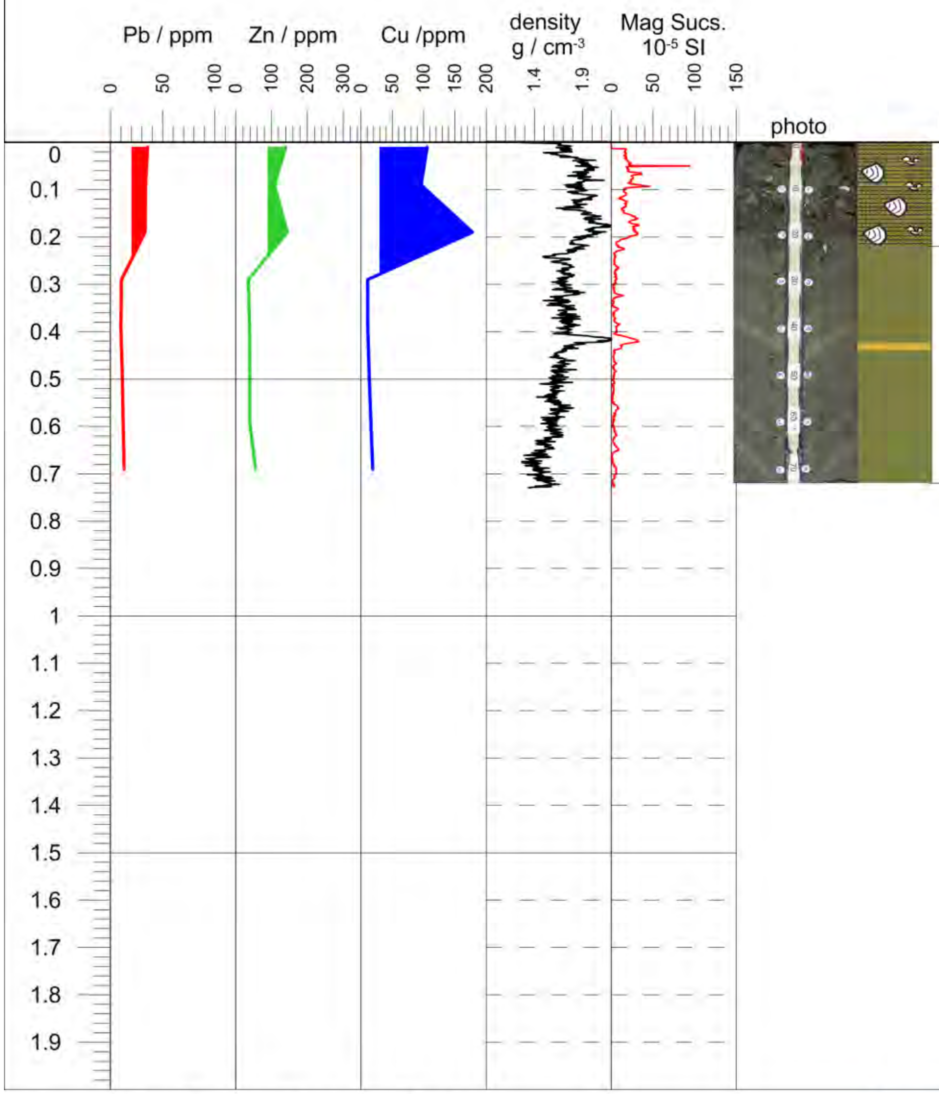
core ID: **GC14**

Location 41.1002 N
73.15022 W



Lithology	Description
Shelly, sandy mud	Sandy mud contains abundant shells and shell fragments . Shells are dominated by M. lateralis. The shells range in size from a few mm's to 1 cm long. Some are well preserved including two valves.
Clay	Clay beds 1-2 cm thick, variegated colors gray. Beds are inclined. 42-43 cm, sand bed.

depth / m
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9

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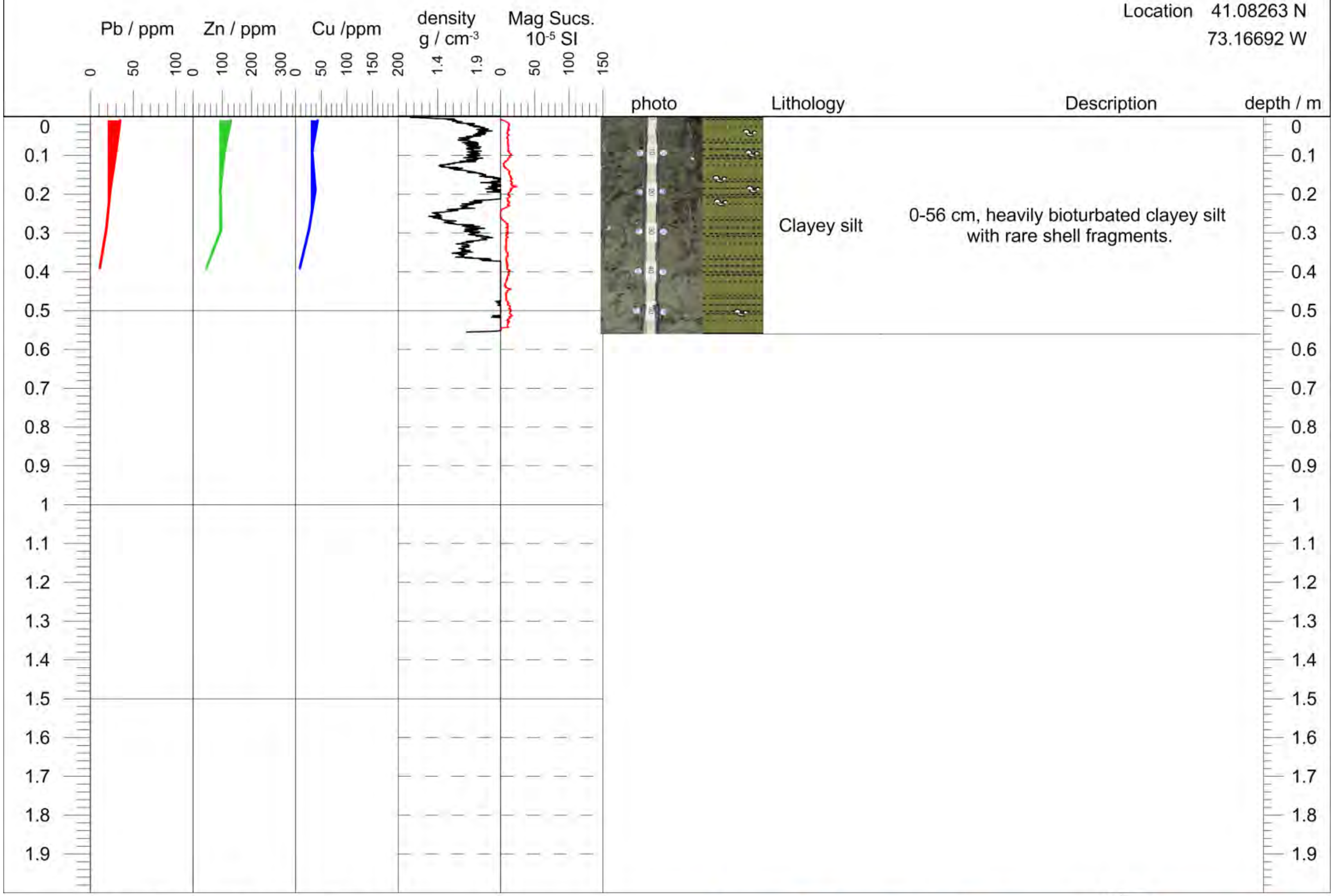
core ID: **GC15**

Location 41.08263 N
73.16692 W



0-56 cm, heavily bioturbated clayey silt with rare shell fragments.

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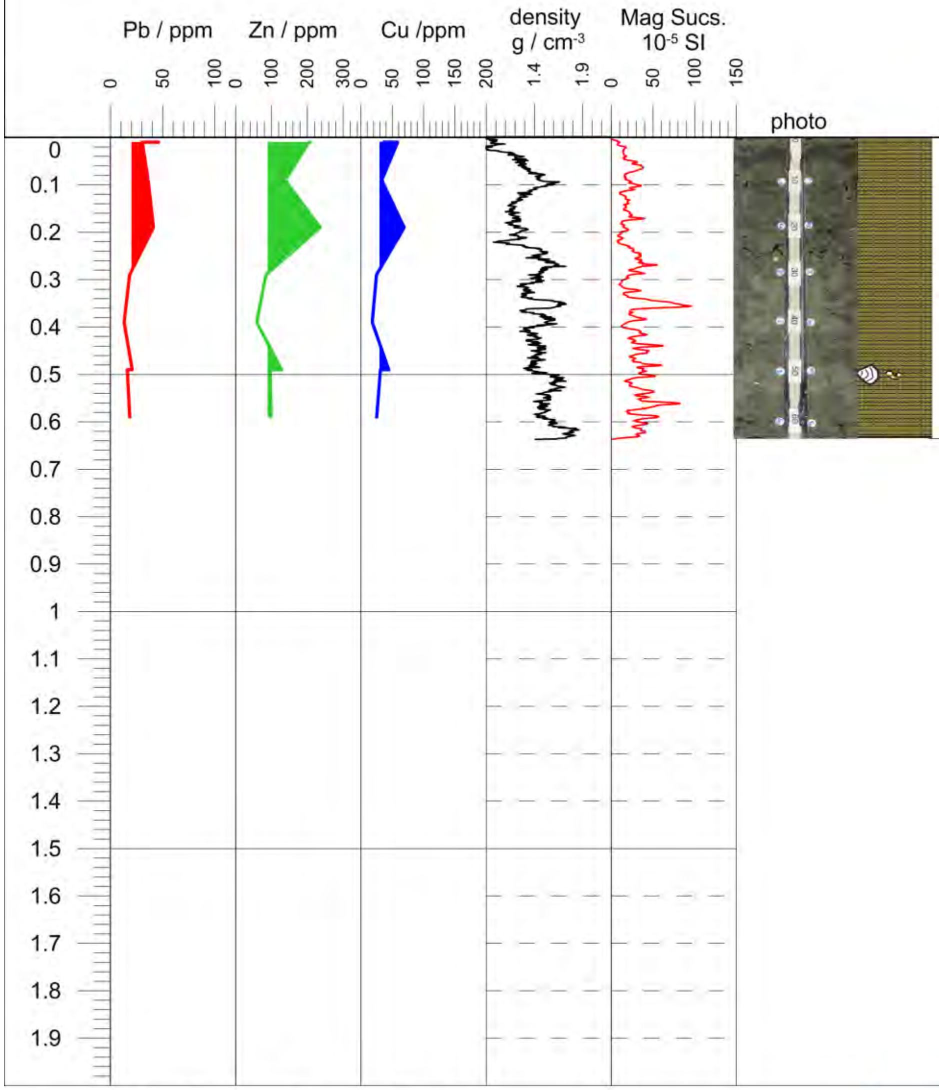
core ID: **GC16**

Location 41.01102 N
73.13873 W



Lithology	Description	depth / m
Coarse sandy mud	0-63.5, sand is scattered in the mud. 50 cm, large 3 cm mollusk shell.	0–0.6

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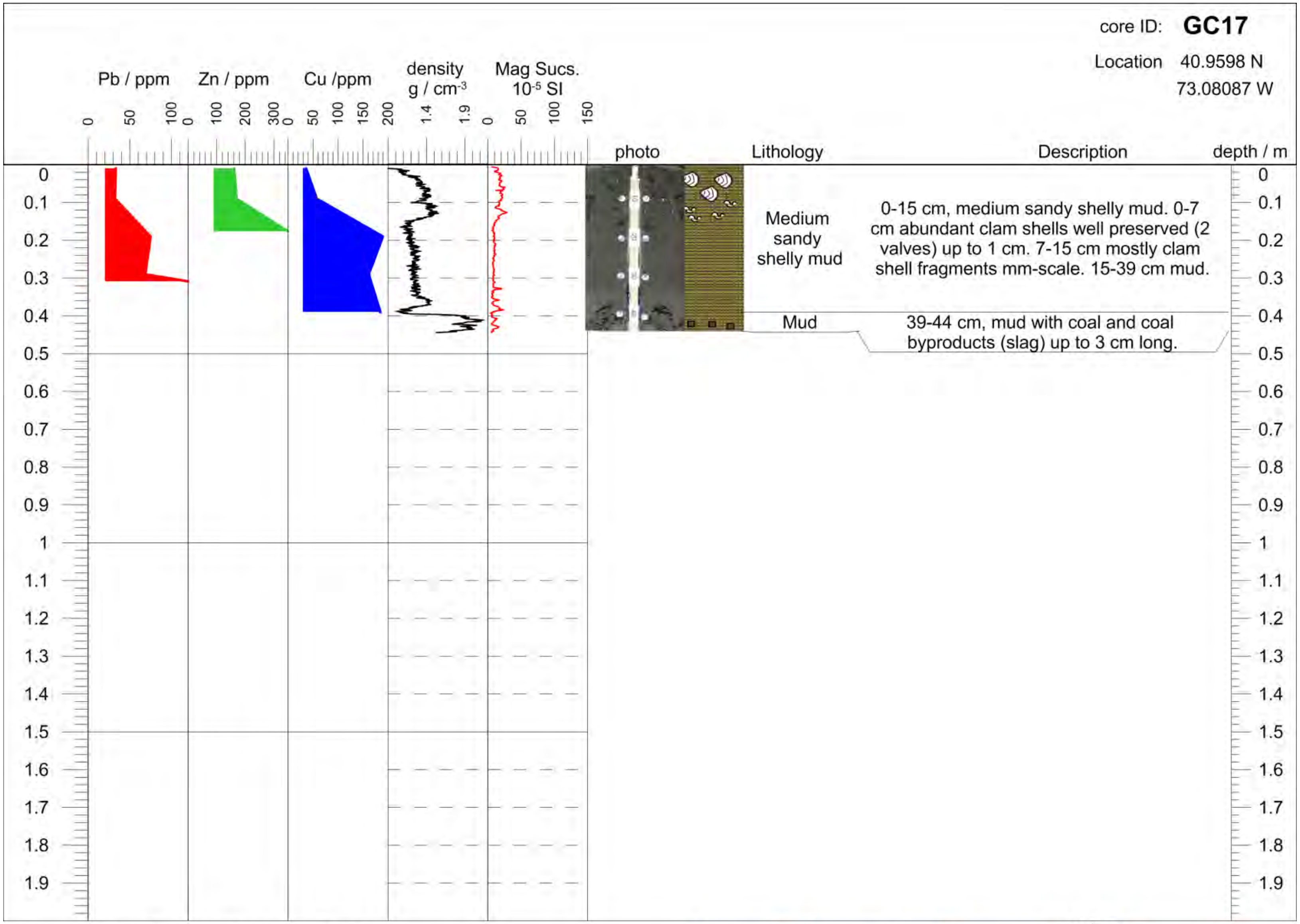
core ID: **GC17**

Location 40.9598 N
73.08087 W



Lithology	Description
Medium sandy shelly mud	0-15 cm, medium sandy shelly mud. 0-7 cm abundant clam shells well preserved (2 valves) up to 1 cm. 7-15 cm mostly clam shell fragments mm-scale. 15-39 cm mud.
Mud	39-44 cm, mud with coal and coal byproducts (slag) up to 3 cm long.

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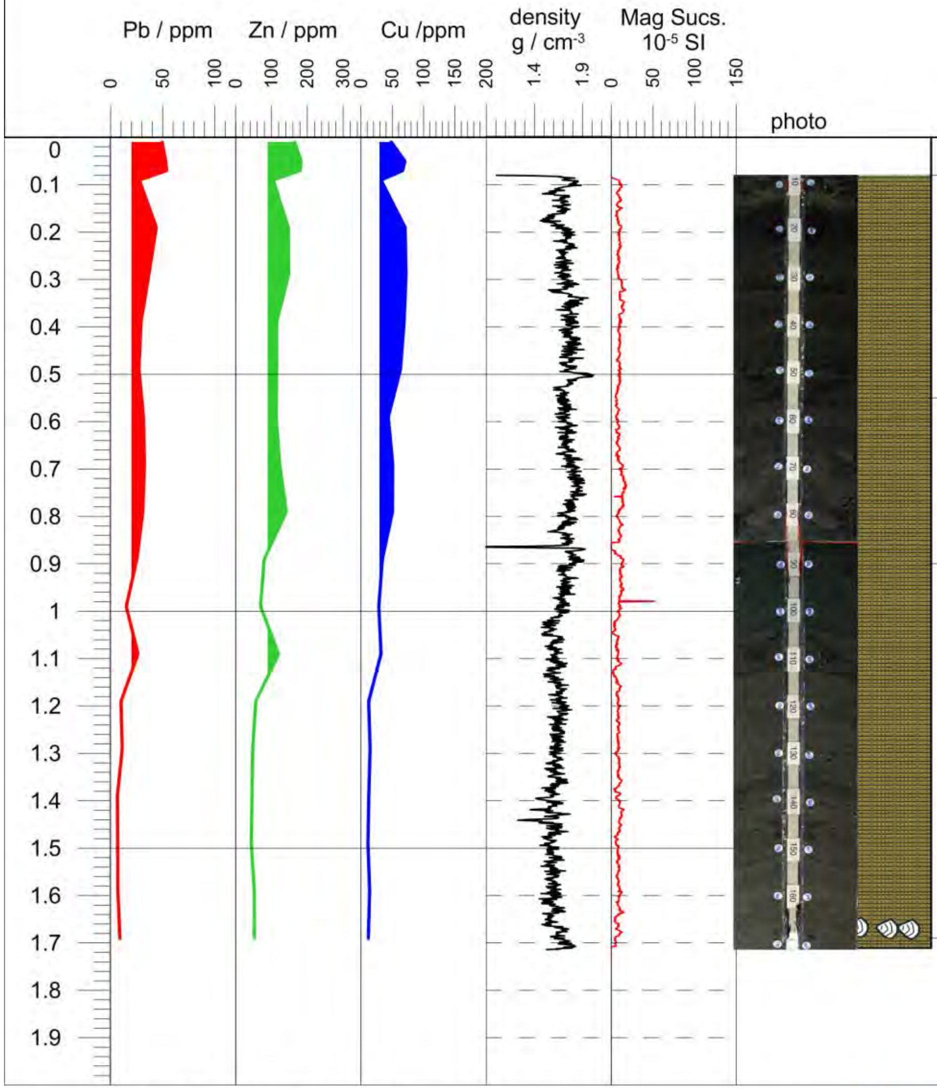
core ID: **GC18**

Location 41.08595 N
73.07435 W



Lithology	Description
Void	
Mud moderately bioturbated	8-55 cm, mud with rare scattered shell fragments, mm scale, also whole clam shells including <mm clams with two valves.
Mud heavily bioturbated	55-90 cm, heavily bioturbated mud.
Color banded mud	100-130 cm, color banding light and dark olive green. 130-150 cm, abundant gas escape features. 168-169 cm, clam bed shells mm-scale

depth / m: 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9

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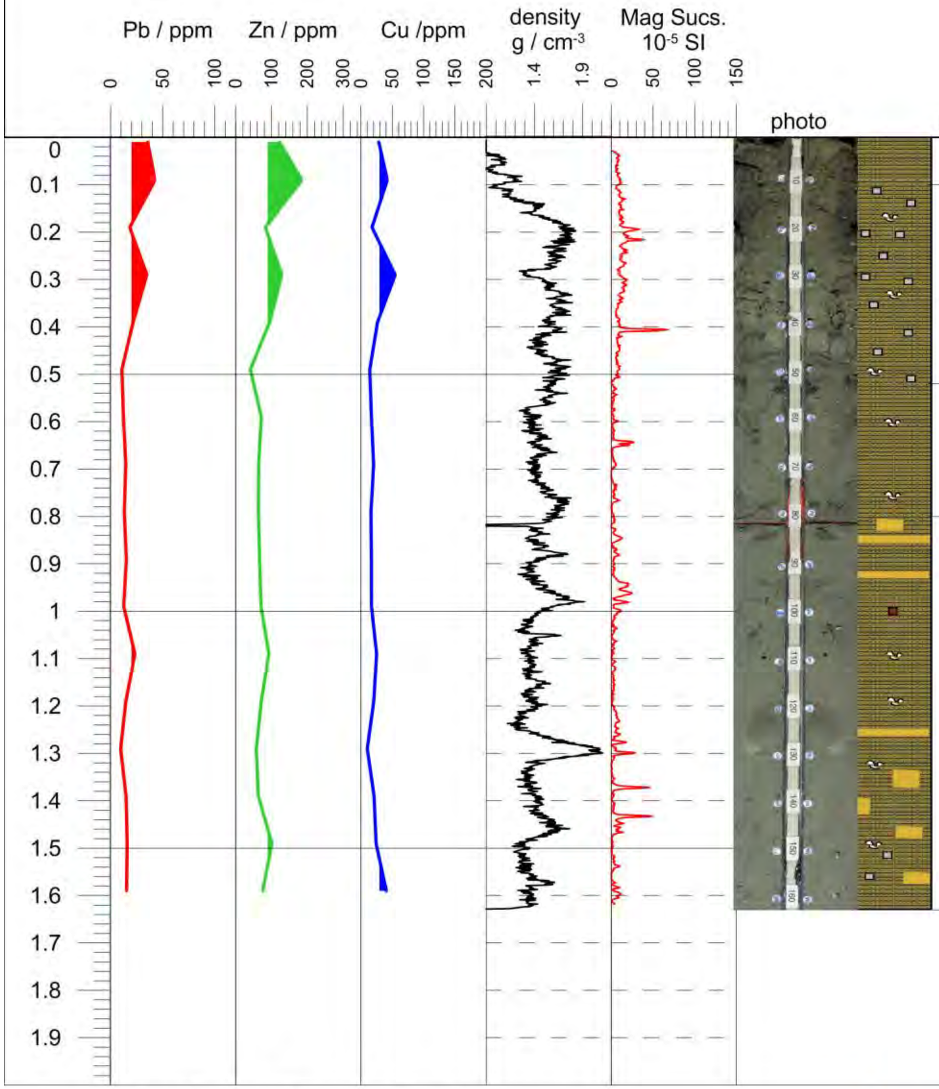
core ID: **GC19**

Location 41.07212 N
73.07458 W



Lithology	Description
Sandy mud	0-10 cm, sandy mud moderately bioturbated and mottled. 0-10 cm, sandy mud disturbed either coring or splitting of core.
Gravelly sandy mud	10-52 cm, gravelly sandy mud containing floating lithic clasts, subangular to subrounded and mainly composed of quartz. 10-20 cm, less abundant lithic clasts only a few mm in size. 20-52 cm, lithic clasts more abundant than 10-20 cm and up to 2 cm long. 20-52 cm scattered shell fragments.
Mud	52-80 cm, mud with scattered, few millimeters long shell fragments, moderate bioturbation and mottling.
Gravelly sandy mud	80-82 cm, disseminated lenses of coarse sand. 85-86cm, coarse sand beds. 93-98 cm, coarse sand beds. 98 cm, woody material. 120-129 cm mottling. 134-137 cm, disseminated lenses of coarse sand. 139-149 cm, disseminated lenses of coarse sand. 125-130cm, coarse sand beds. 150 cm gravel-size lithic clasts. 155 cm, gravel size lithic clasts. 158-160 cm, pebbly, coarse sand pocket.

depth / m
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9

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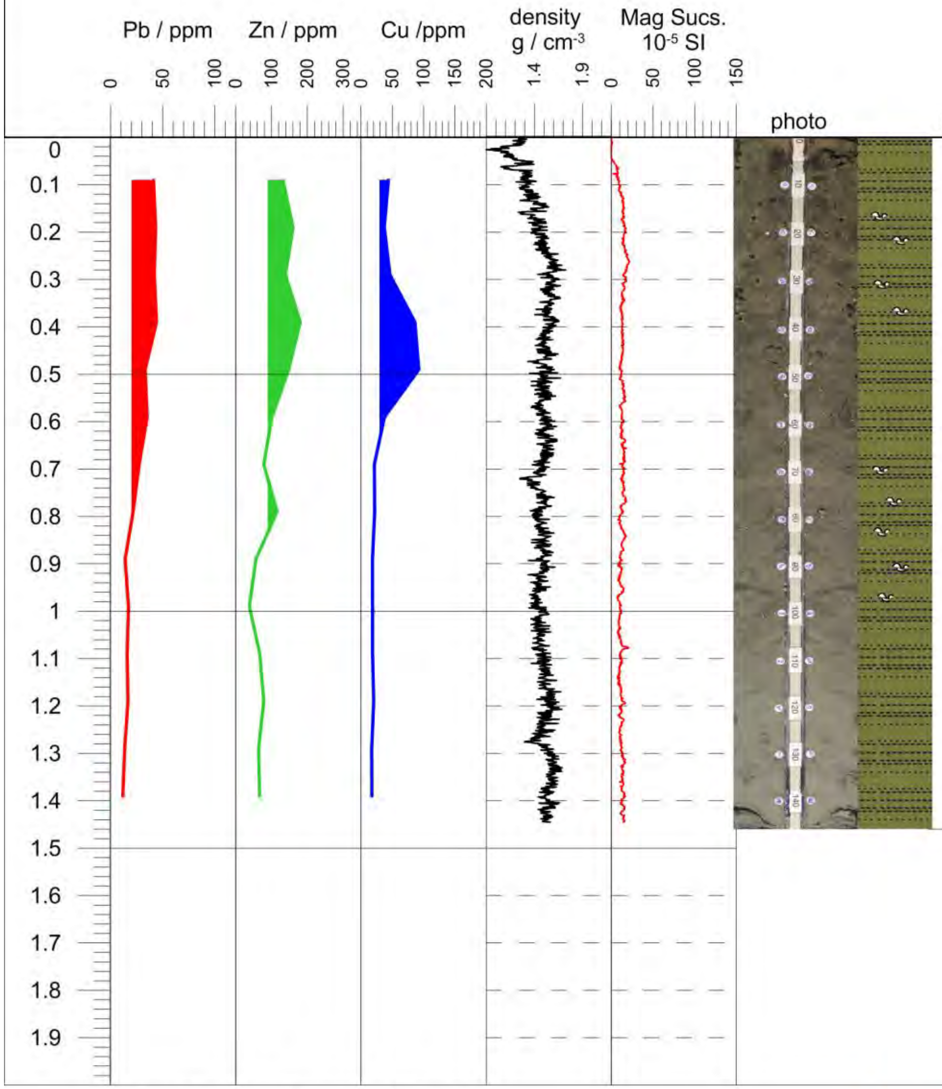
core ID: **GC20**

Location 41.06533 N
73.04598 W



Description

0-1.46 cm, heavily to moderately bioturbated mud scattered with shells and shell fragments. 0-60 cm, heavy bioturbation. 18-20 cm, shells and shell fragments most abundant. 30-35 cm, shells and shell fragments most abundant. 60-146 cm, moderate bioturbation. 70-100 cm, shells and shell fragments most abundant.

depth / m

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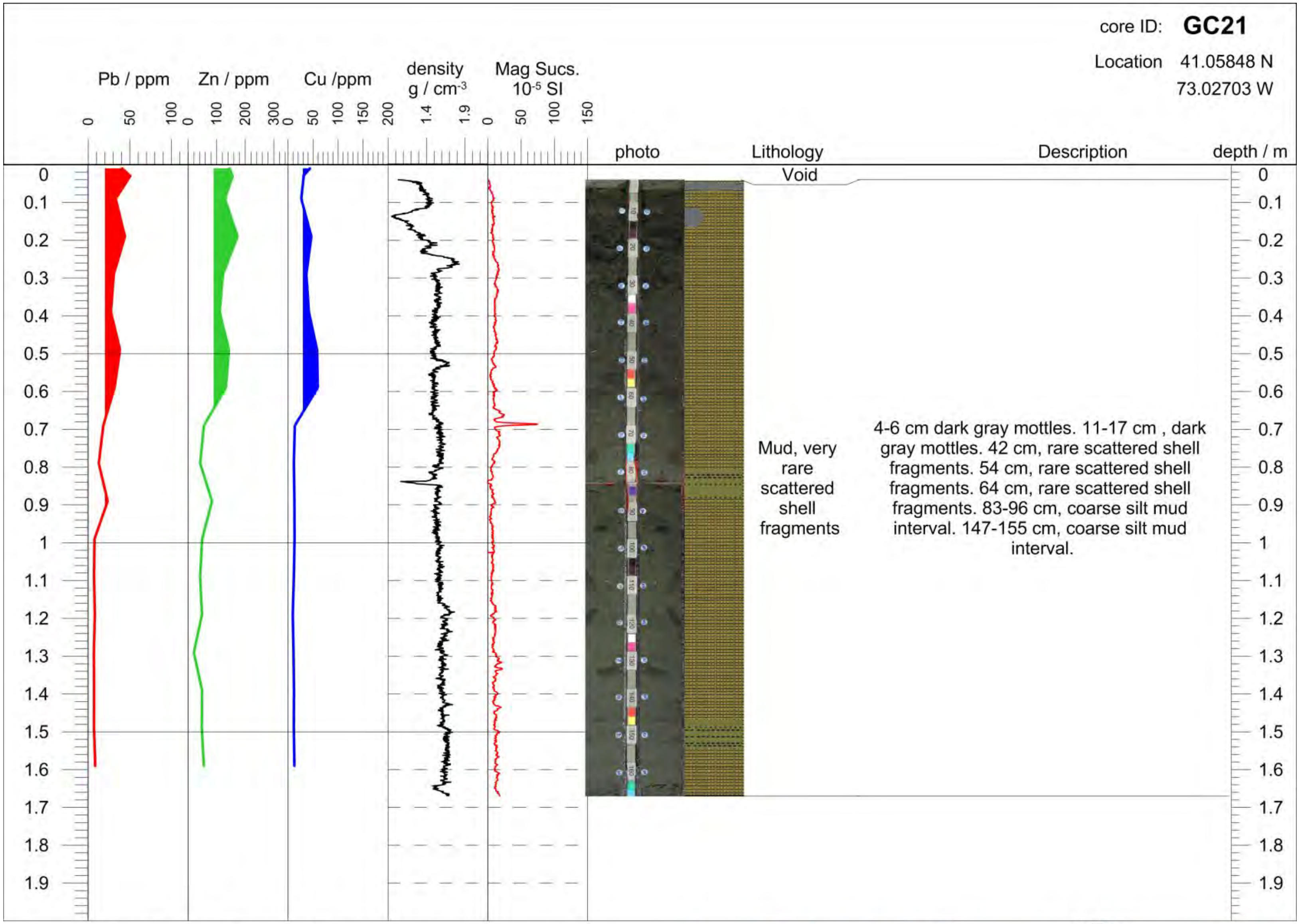
core ID: **GC21**

Location 41.05848 N
73.02703 W



4-6 cm dark gray mottles. 11-17 cm , dark gray mottles. 42 cm, rare scattered shell fragments. 54 cm, rare scattered shell fragments. 64 cm, rare scattered shell fragments. 83-96 cm, coarse silt mud interval. 147-155 cm, coarse silt mud interval.

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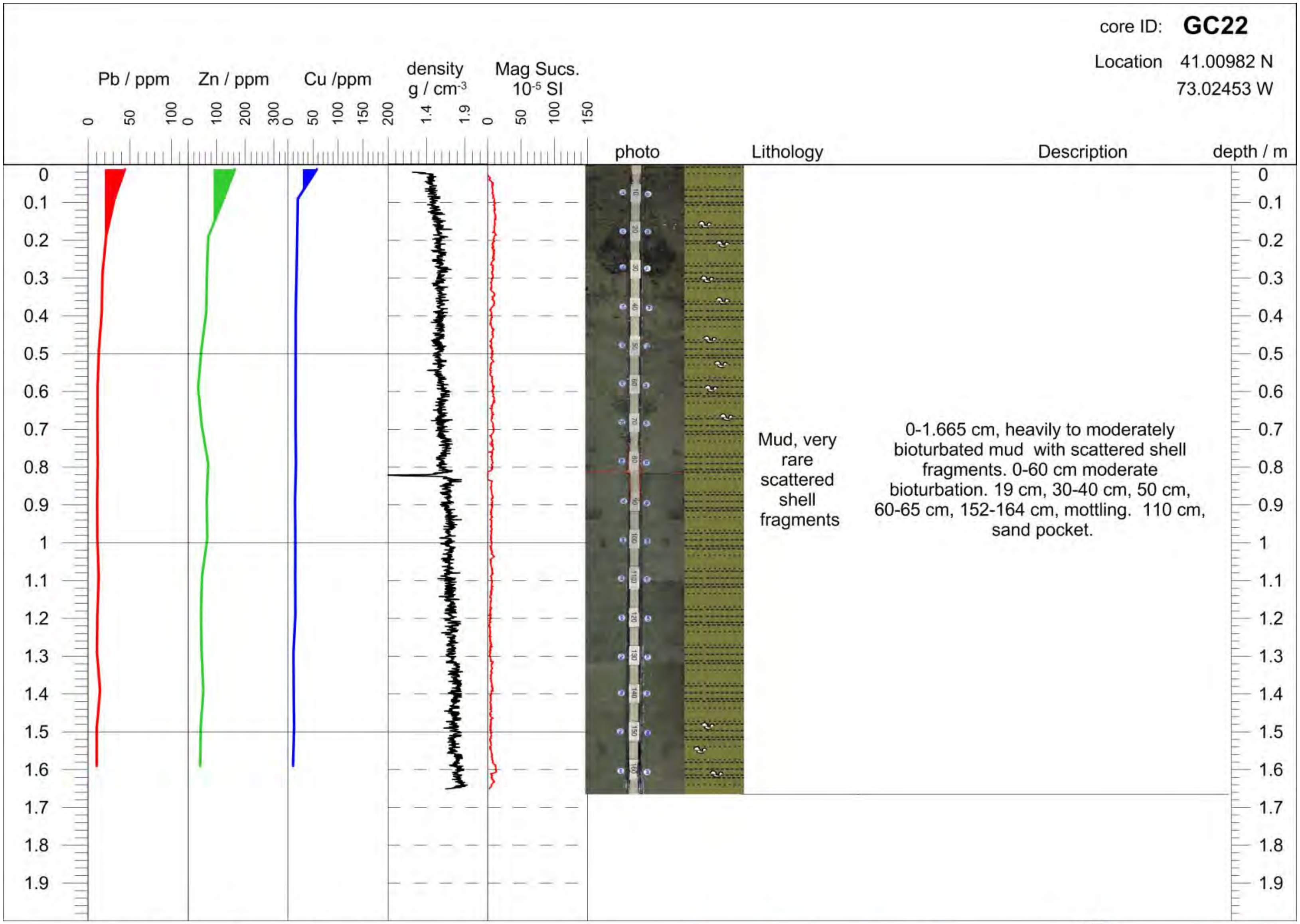
core ID: **GC22**

Location 41.00982 N
73.02453 W



Mud, very rare scattered shell fragments

0-1.665 cm, heavily to moderately bioturbated mud with scattered shell fragments. 0-60 cm moderate bioturbation. 19 cm, 30-40 cm, 50 cm, 60-65 cm, 152-164 cm, mottling. 110 cm, sand pocket.

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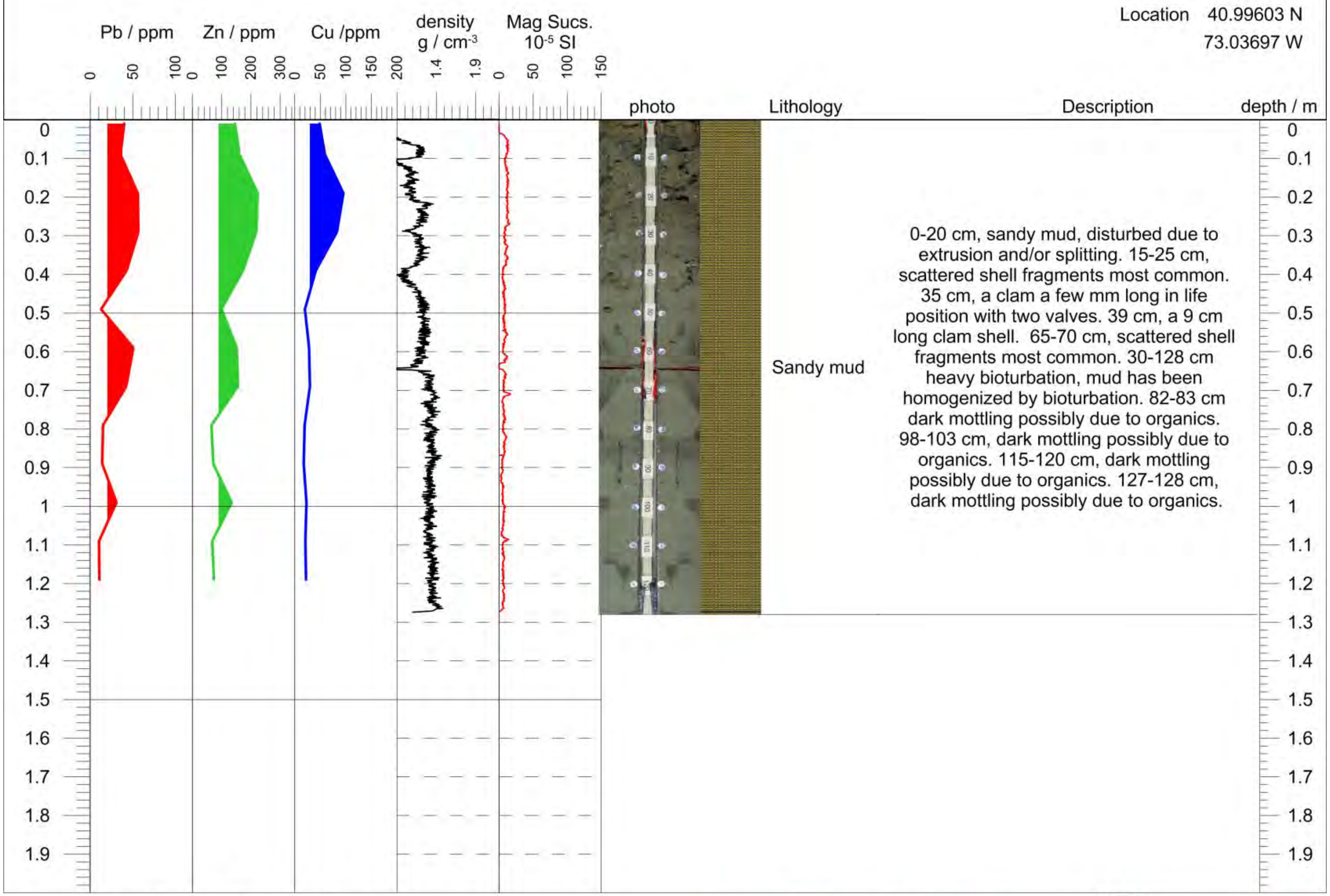
core ID: **GC23**

Location 40.99603 N
73.03697 W



0-20 cm, sandy mud, disturbed due to extrusion and/or splitting. 15-25 cm, scattered shell fragments most common. 35 cm, a clam a few mm long in life position with two valves. 39 cm, a 9 cm long clam shell. 65-70 cm, scattered shell fragments most common. 30-128 cm heavy bioturbation, mud has been homogenized by bioturbation. 82-83 cm dark mottling possibly due to organics. 98-103 cm, dark mottling possibly due to organics. 115-120 cm, dark mottling possibly due to organics. 127-128 cm, dark mottling possibly due to organics.

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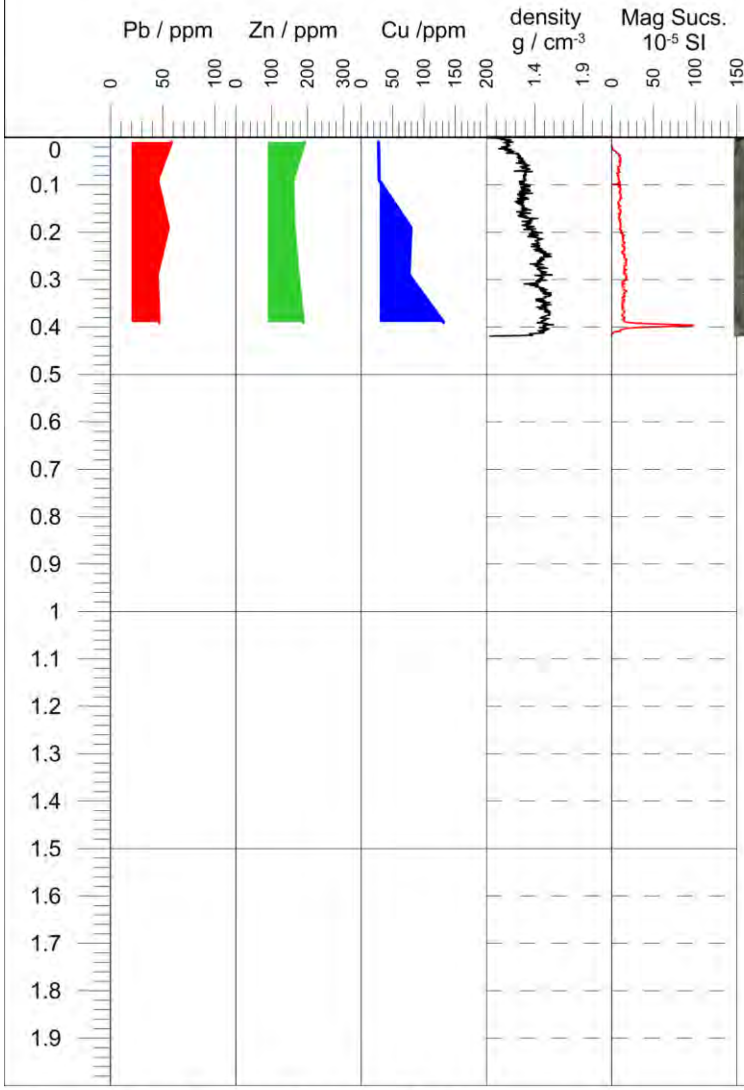
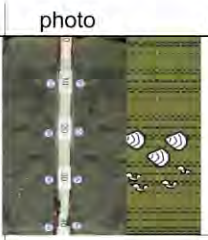
core ID: **HDC01**

Location 41.05977 N
73.15915 W

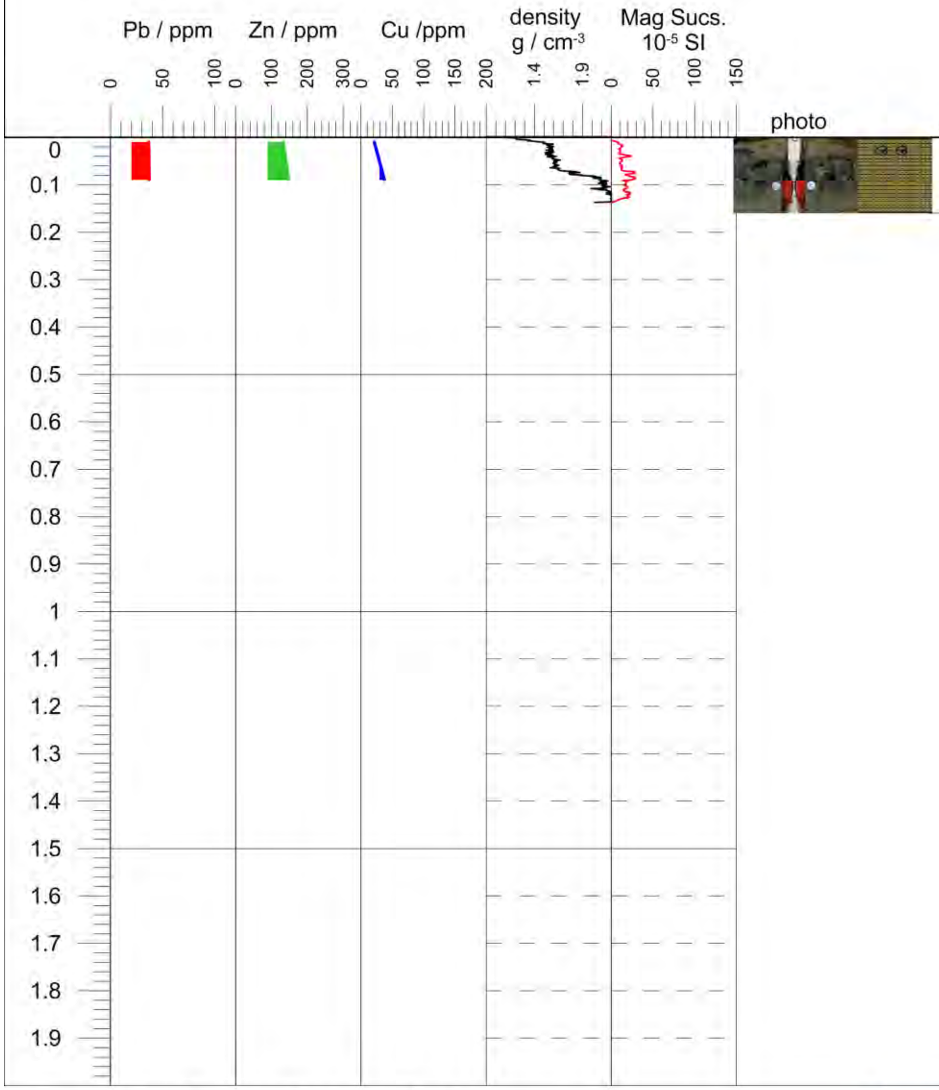




Lithology	Description	depth / m
Mud, rich in coarse silt and shells	0-10 cm, gas escape features, worm track. 10-23 cm, mud. 23-35 cm scattered clam shells up to 1 cm long with two valves, most well-preserved. Shell fragments also present. 35-42 cm, mud	0 – 0.4

core ID: **HDC02**

Location 41.07025 N
73.0776 W



Lithology	Description	depth / m
Medium sandy mud	0-16 cm, abundant gas escape features 1 to 2 cm long, well preserved gastropod tests, no clams.	0

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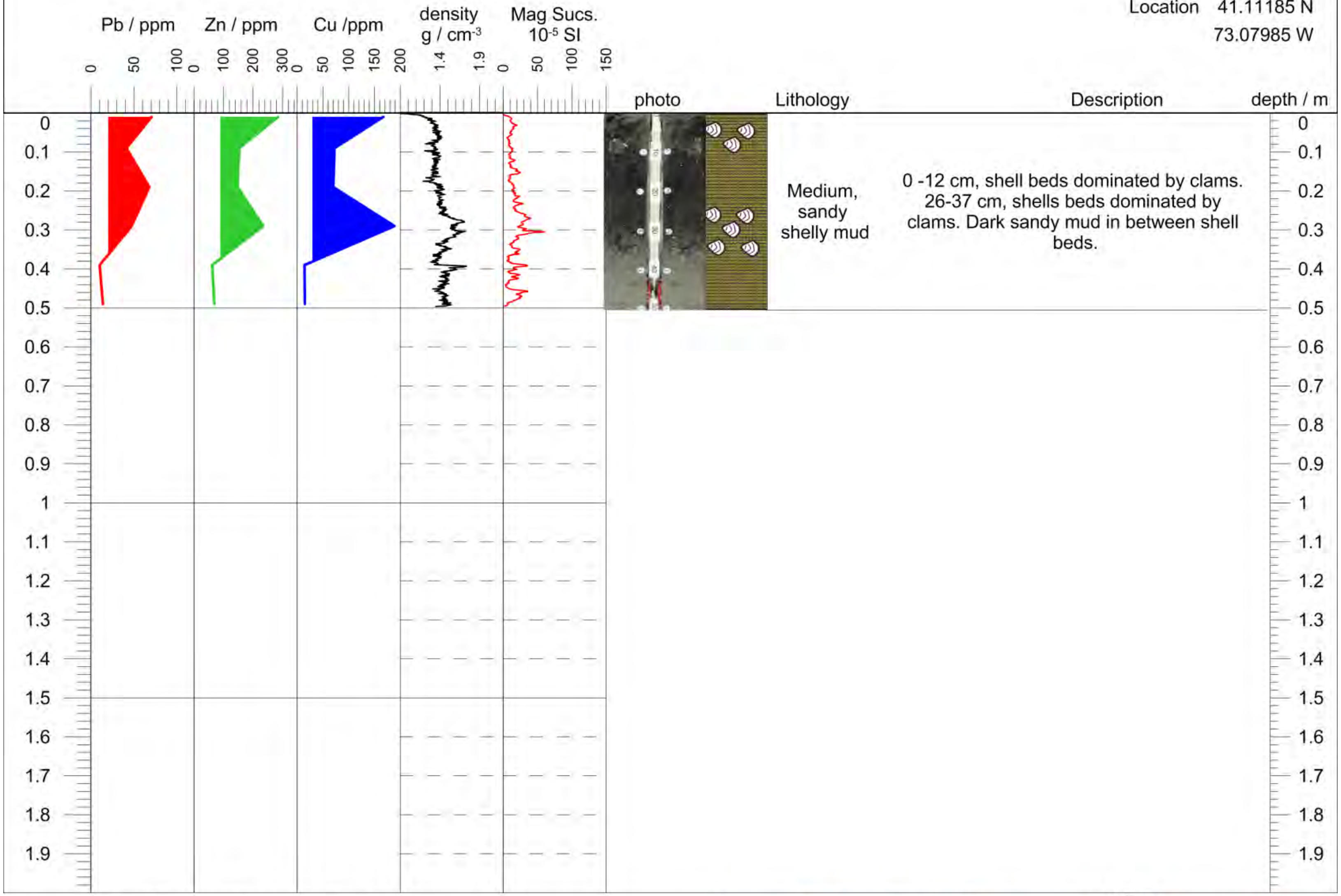
core ID: **HDC03**

Location 41.11185 N
73.07985 W



Lithology	Description
Medium, sandy shelly mud	0 -12 cm, shell beds dominated by clams. 26-37 cm, shells beds dominated by clams. Dark sandy mud in between shell beds.

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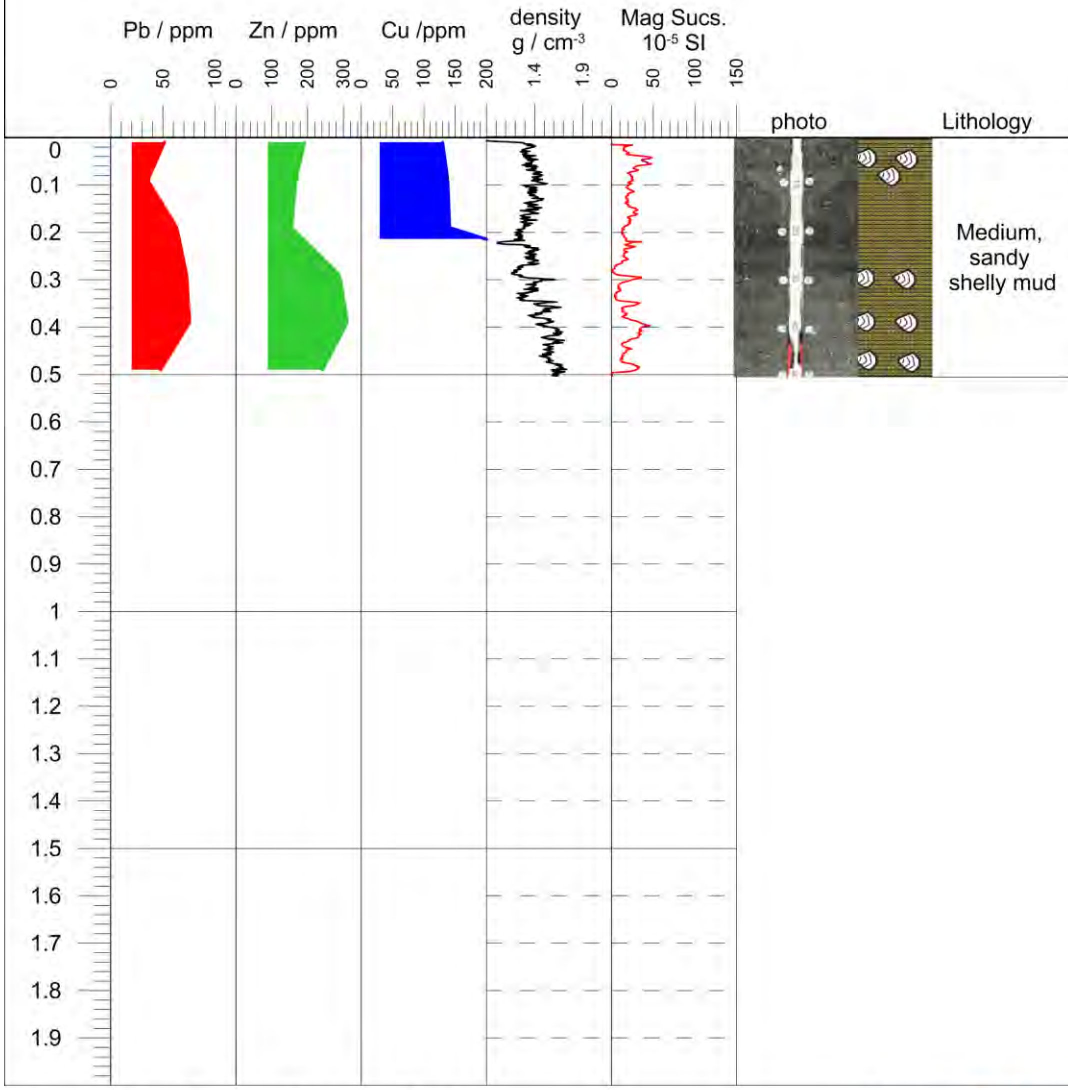
core ID: **HDC04**

Location 41.13007 N
73.0921 W

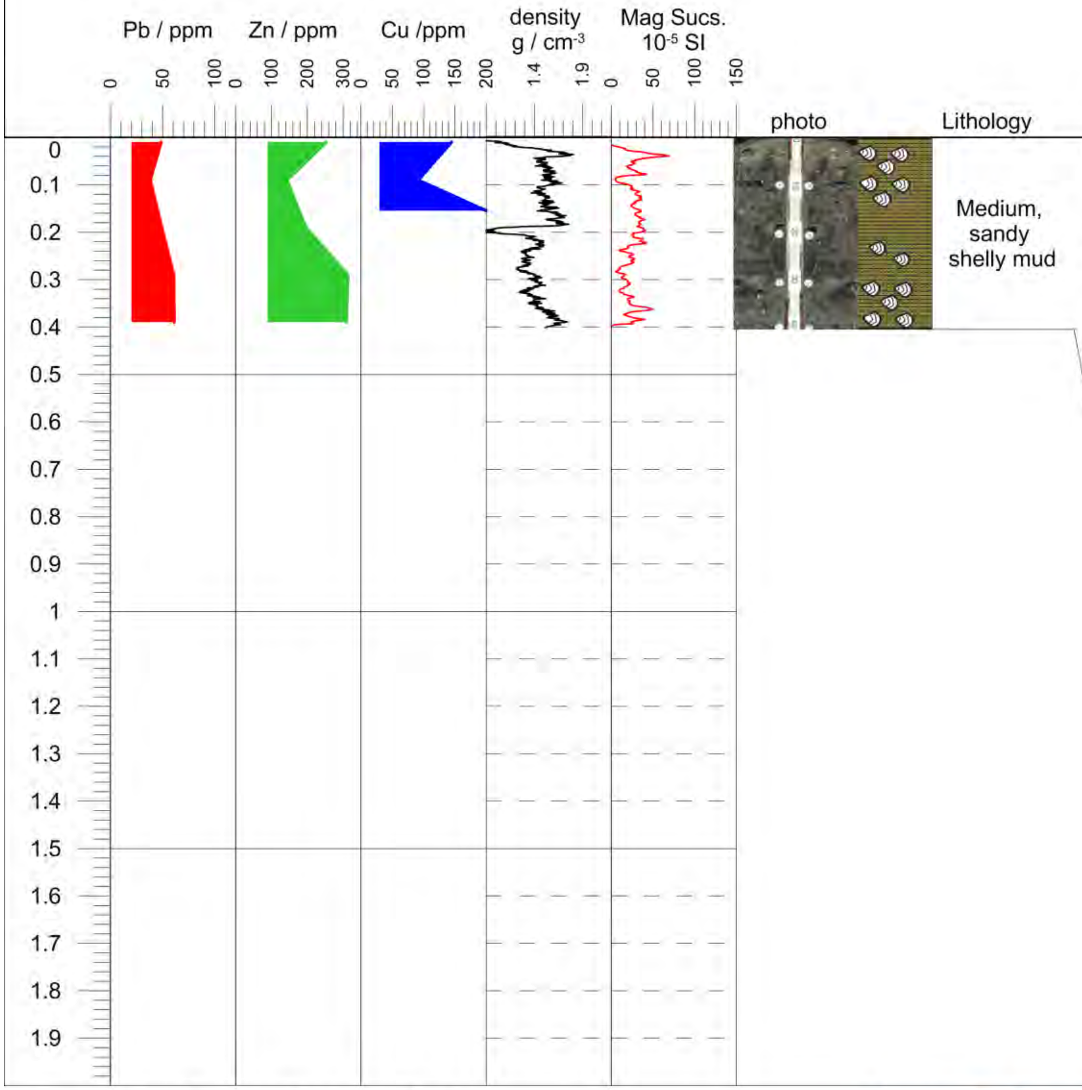


Description	depth / m
0-12 cm, shell beds dominated by clams (mm-scale), well preserved. 30-31 cm shells beds dominated by clams (mm-scale), well preserved. 39-40 cm, shells beds dominated by clams (mm-scale), well preserved. 42-44 cm shells beds dominated by clams (mm-scale), well preserved. 46-69 cm, shells beds dominated by clams (mm-scale), well preserved. Dark mud in between beds.	0–0.5

depth / m: 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9

core ID: **HDC05**

Location 41.13838 N
73.0858 W



Description

0-20 cm, shells beds dominated by clams, mostly mm-scale but up to 2.5 cm long. Shells are well preserved and are very abundant. 20-30 cm, shells beds dominated by clams, mostly mm-scale but up to 2.5 cm long. Shells are well preserved, form beds but are also scattered. 30-40 cm, shells are dominated by clams, mostly mm-scale but up to 2.5 cm long. Shells are well preserved, form beds and are abundant.

depth / m

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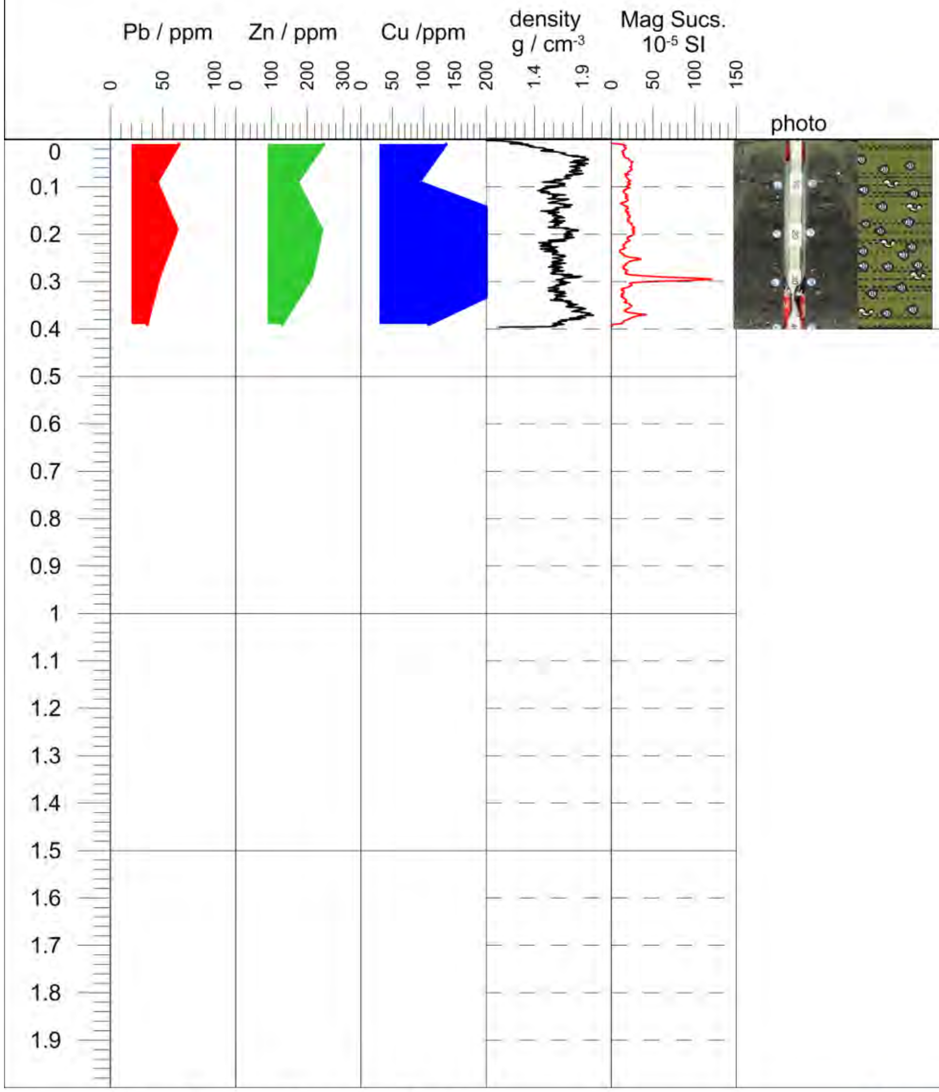
core ID: **HDC06**

Location 41.14503 N
73.07255 W



Lithology	Description	depth / m
Medium, sandy shelly mud	0-40 cm, shells are dominated by clams, mostly mm-scale and well preserved. Shells and shell fragments are scattered throughout and constitute 20% of the core	0-0.4

depth / m: 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9

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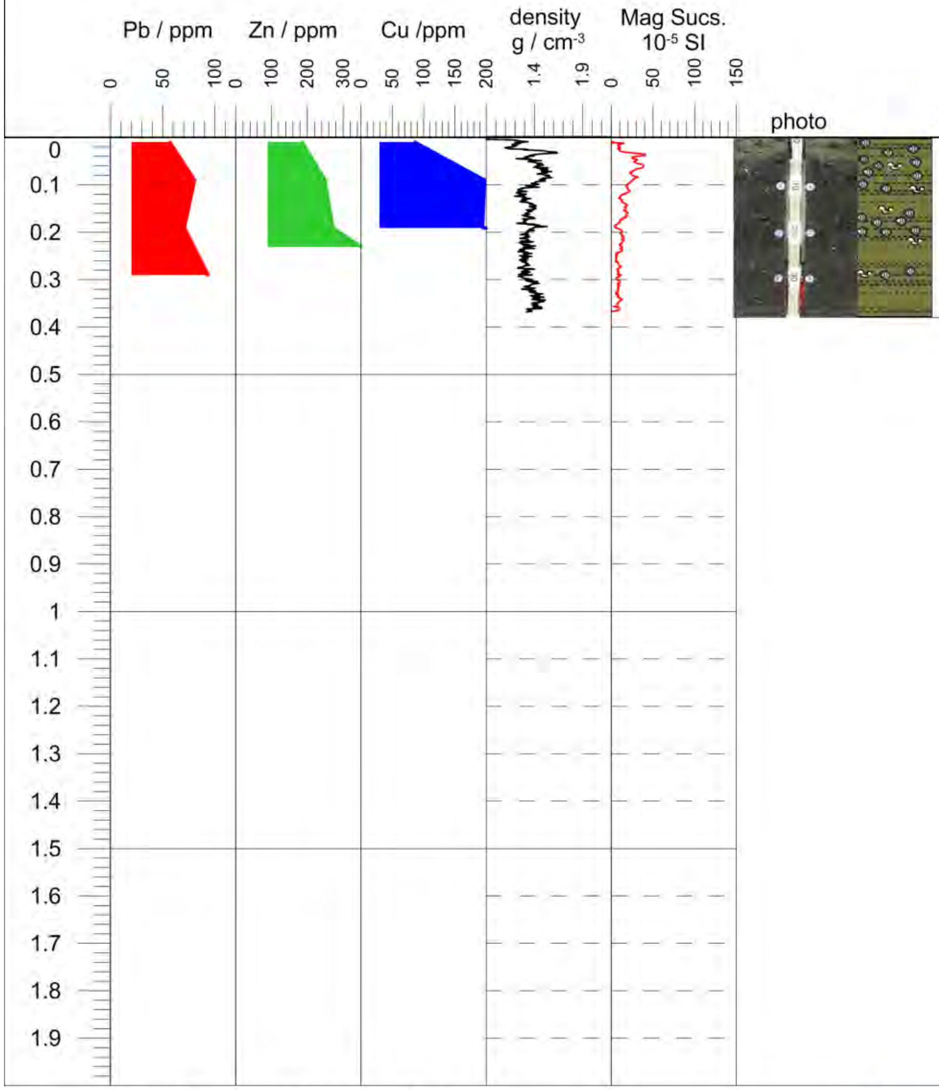
core ID: **HDC07**

Location 41.16917 N
73.0741 W



Lithology	Description	depth / m
Medium sandy shelly mud	0-10 cm, shell beds. 17-23 cm, shell beds dominated by clams, mostly mm-scale and well preserved. Shell fragments also present.	0–0.38

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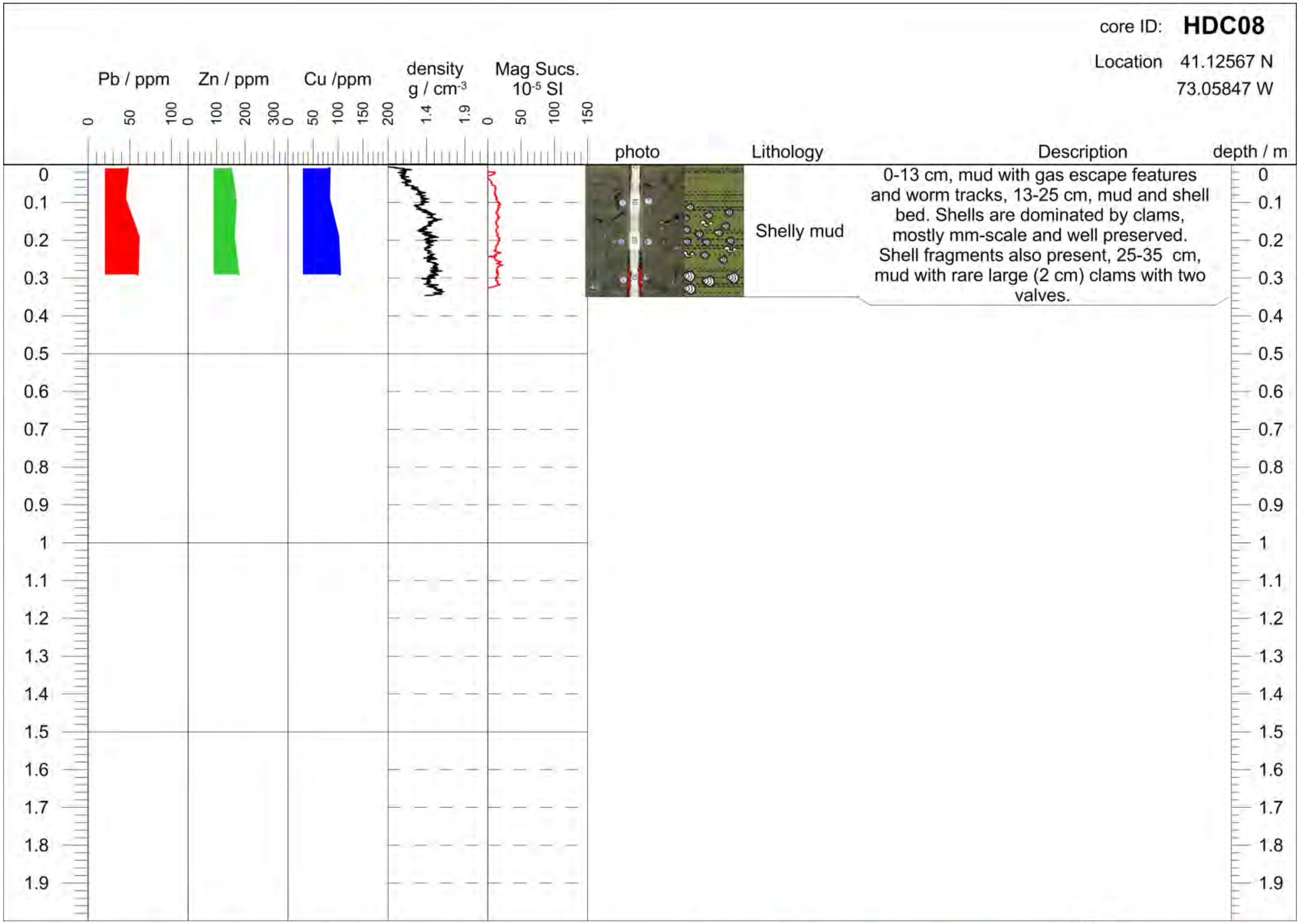

core ID: **HDC08**

Location 41.12567 N
73.05847 W

0-13 cm, mud with gas escape features and worm tracks, 13-25 cm, mud and shell bed. Shells are dominated by clams, mostly mm-scale and well preserved. Shell fragments also present, 25-35 cm, mud with rare large (2 cm) clams with two valves.

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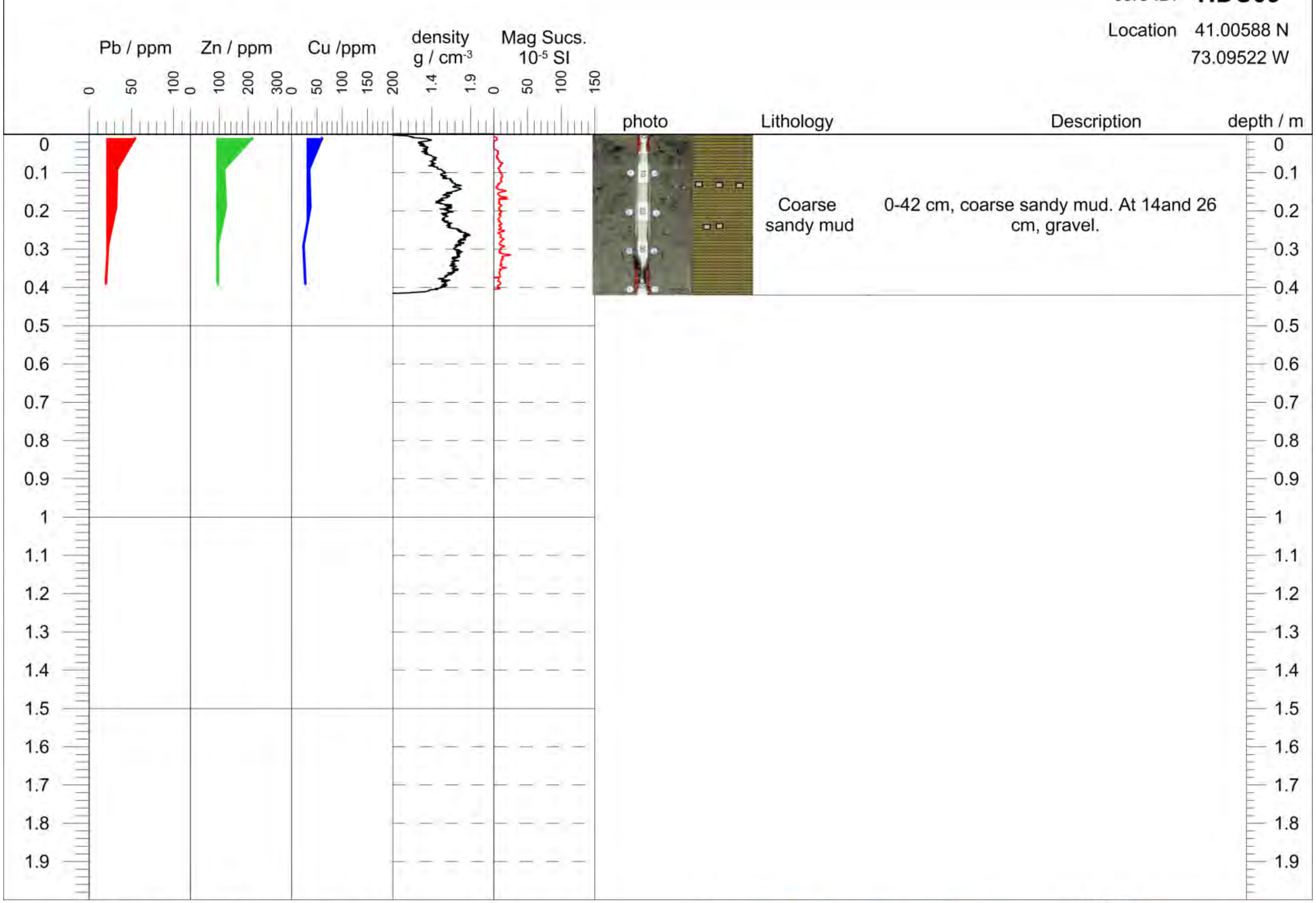
core ID: **HDC09**

Location 41.00588 N
73.09522 W



Lithology	Description
Coarse sandy mud	0-42 cm, coarse sandy mud. At 14and 26 cm, gravel.

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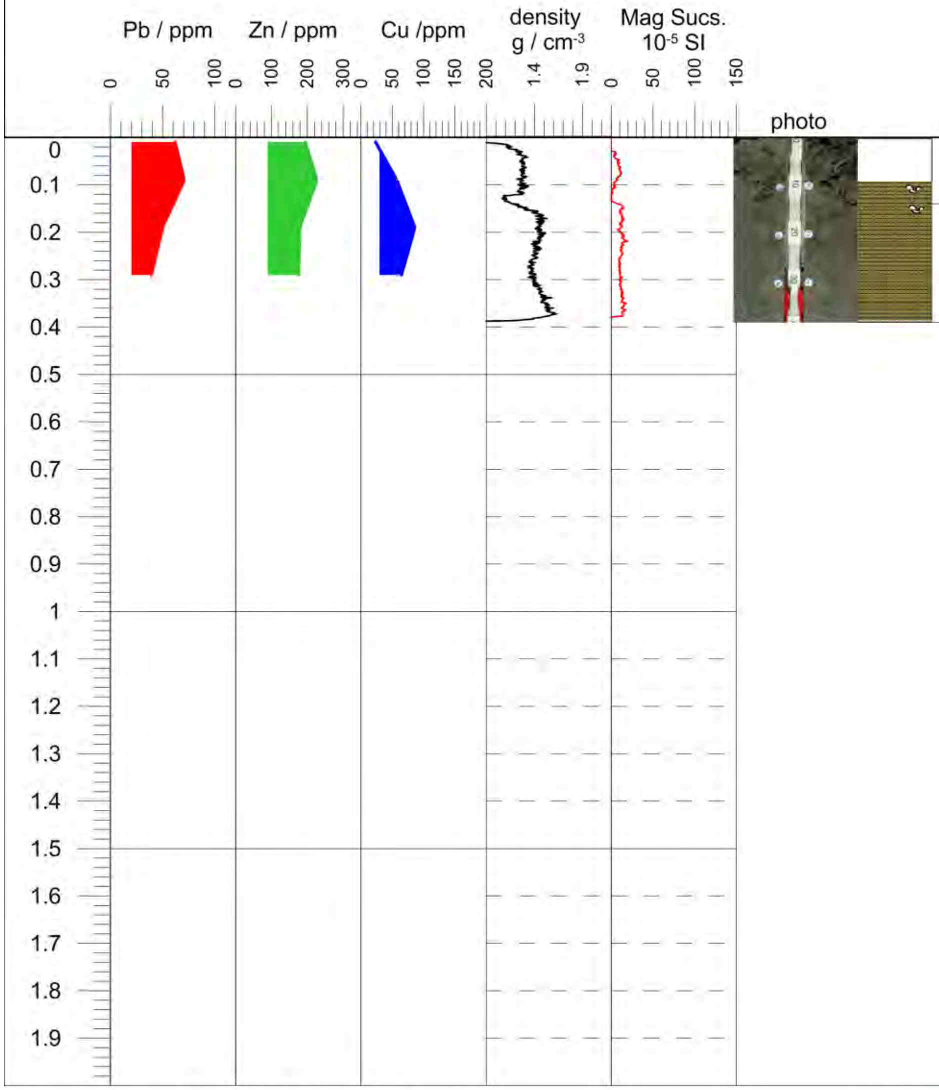
core ID: **HDC10**

Location 41.0493 N
73.0562 W



Lithology	Description
Mud	0-14 cm, medium sandy mud deformed. Upper part contained a 10 cm long worm.
Medium sandy mud	14- 39 cm, medium sandy mud with few scattered shell fragments 10-15 cm

depth / m

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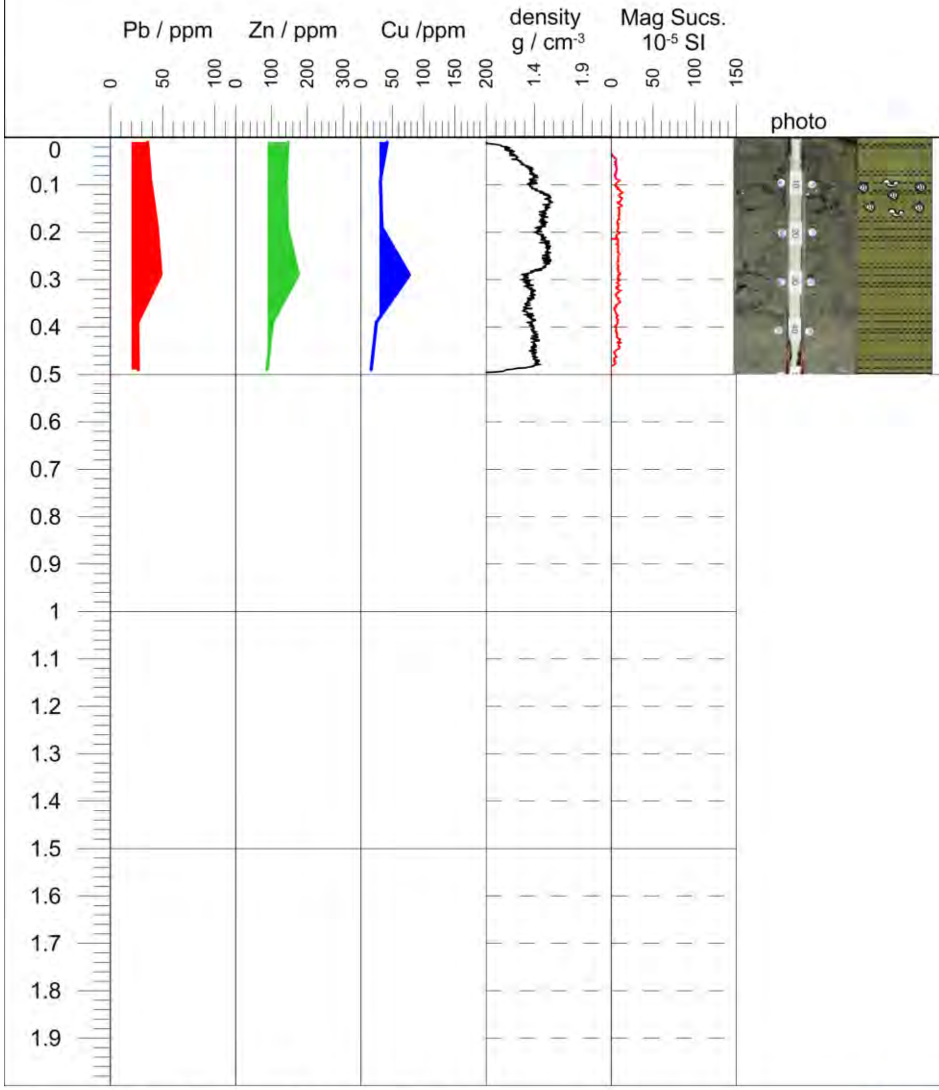
core ID: **HDC11**

Location 41.02955 N
73.12478 W



Lithology	Description
Mud	0-15 cm, mud with gas escape features, 10-15 cm, mud with clam shells and fragments

depth / m
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9

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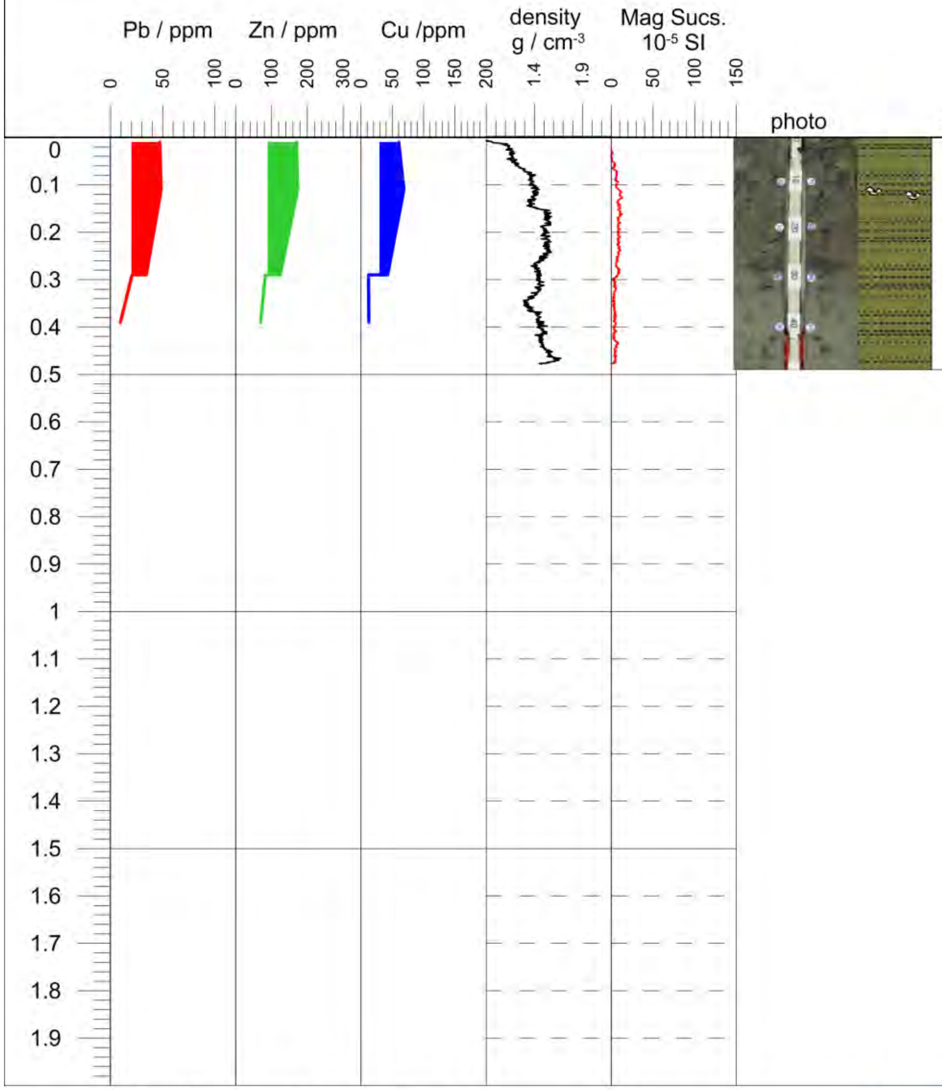
core ID: **HDC12**

Location 41.05833 N
73.12427 W



Lithology	Description	depth / m
Mud	0-49 cm, mud. 12 cm, shell fragments	0–0.5

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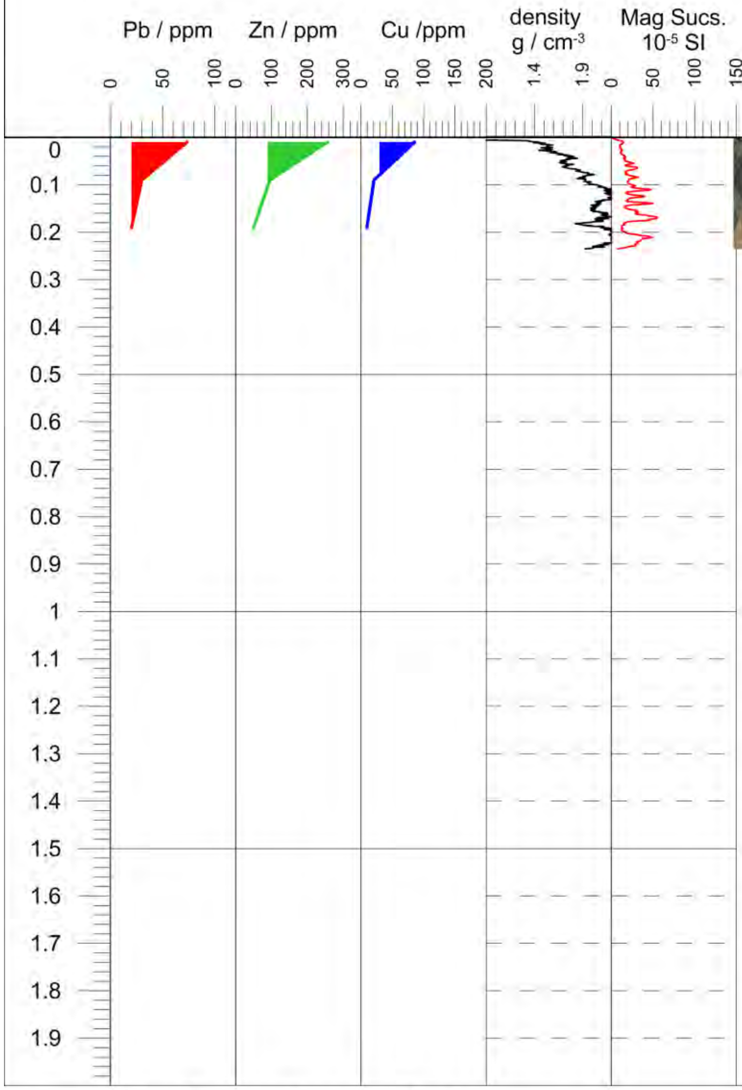
core ID: **HDC13**

Location 41.08505 N
73.10535 W



photo

Lithology	Description
Mud	0-9 cm, mud.
Mud	9-18 cm, coarse muddy sand.
Coarse muddy sand	18-23.5 cm, reddish pink clay with scour surface on top and a large shell fragment in scoured surface, likely a razor clam.

depth / m
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9

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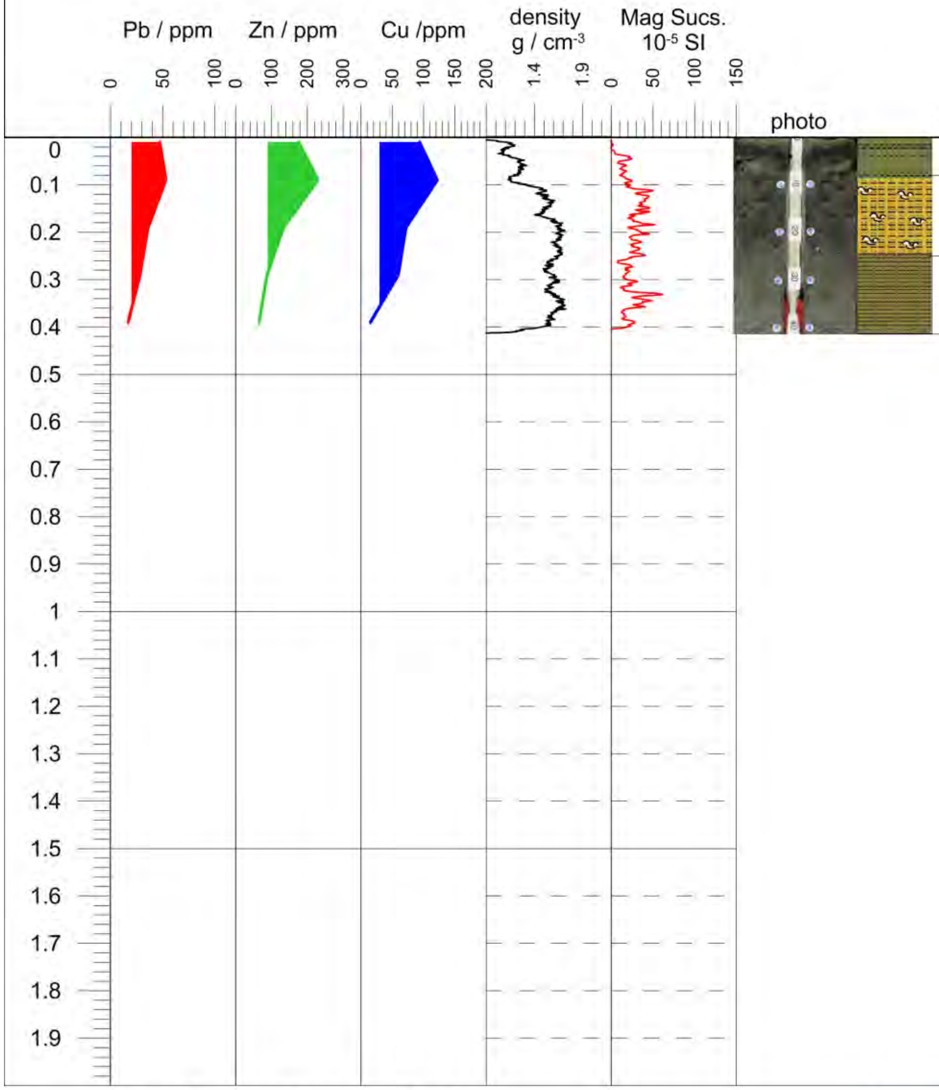
core ID: **HDC14**

Location 41.09445 N
73.12832 W



Lithology	Description
Mud	0-8 cm, mud.
Muddy coarse sand	8- 25 cm, muddy coarse sand with shell fragments mm scale.
Sandy mud	25-41.5 cm sandy mud with abundant mica

depth / m: 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, 1, 1.1, 1.2, 1.3, 1.4, 1.5, 1.6, 1.7, 1.8, 1.9

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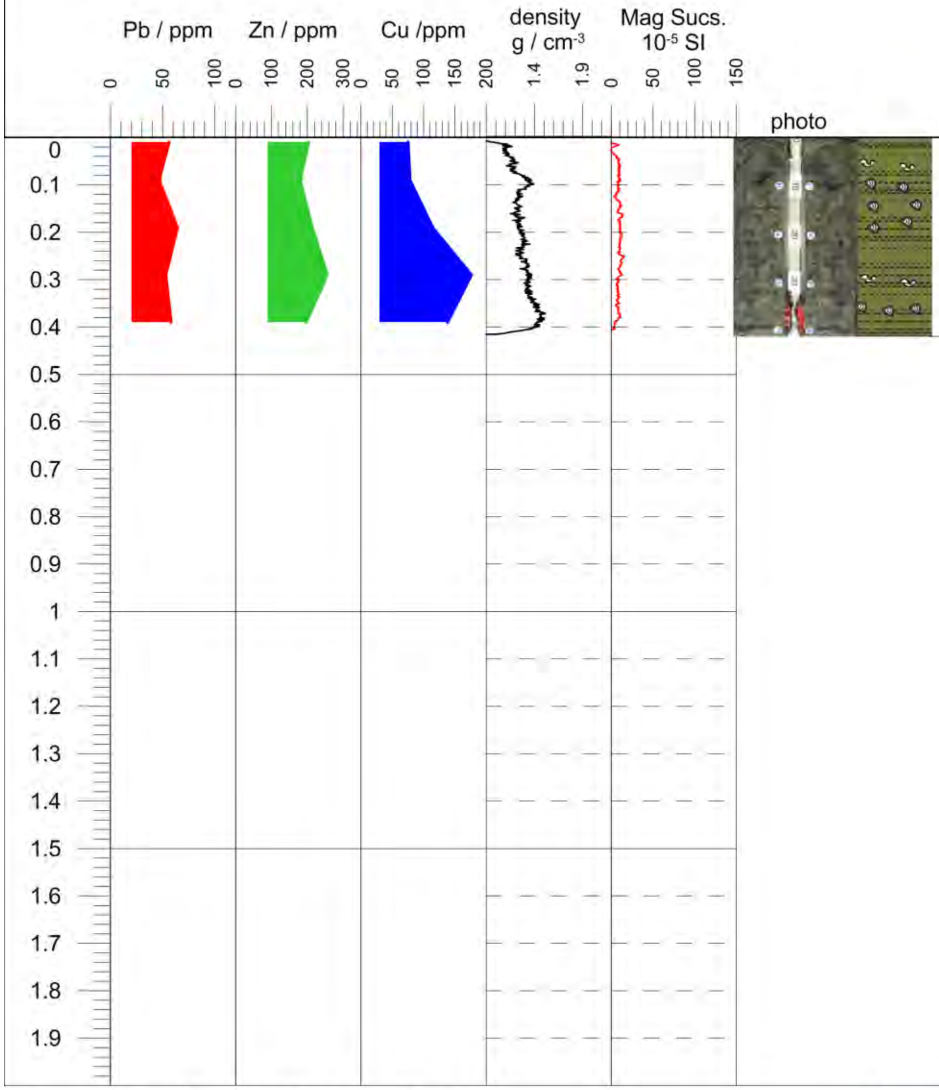
core ID: **HDC15**

Location 41.06777 N
73.1439 W



Lithology	Description	depth / m
Shelly mud	5 cm, shell fragments, 10-20 cm shells are from clams at a mm scale and well preserved through out core. Most abundant at 30 cm, shell fragments. 36-39 cm, shells are from clams at a mm scale and well preserved through out core. Most abundant here.	0–0.4

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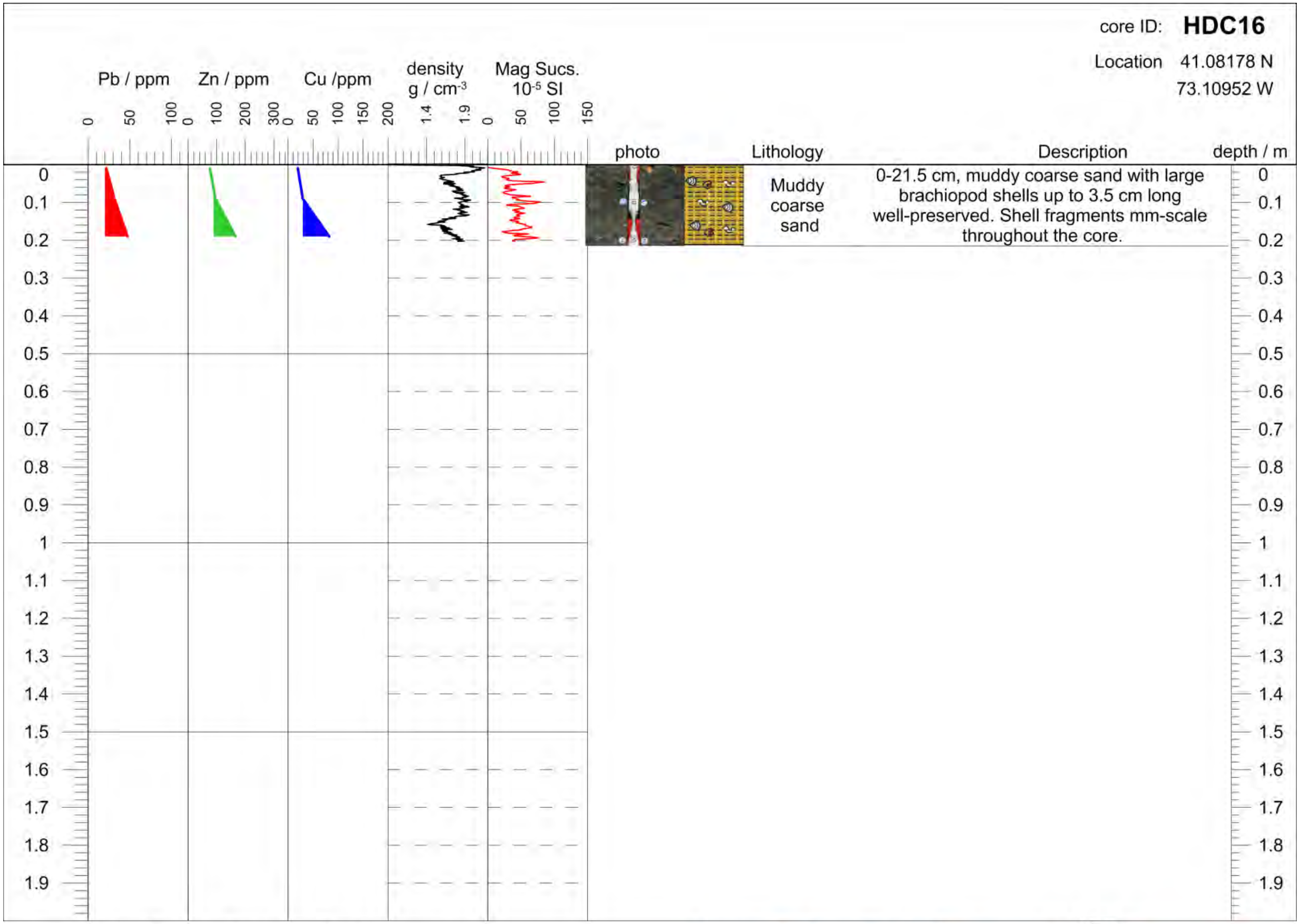
core ID: **HDC16**

Location 41.08178 N
73.10952 W



0-21.5 cm, muddy coarse sand with large brachiopod shells up to 3.5 cm long well-preserved. Shell fragments mm-scale throughout the core.

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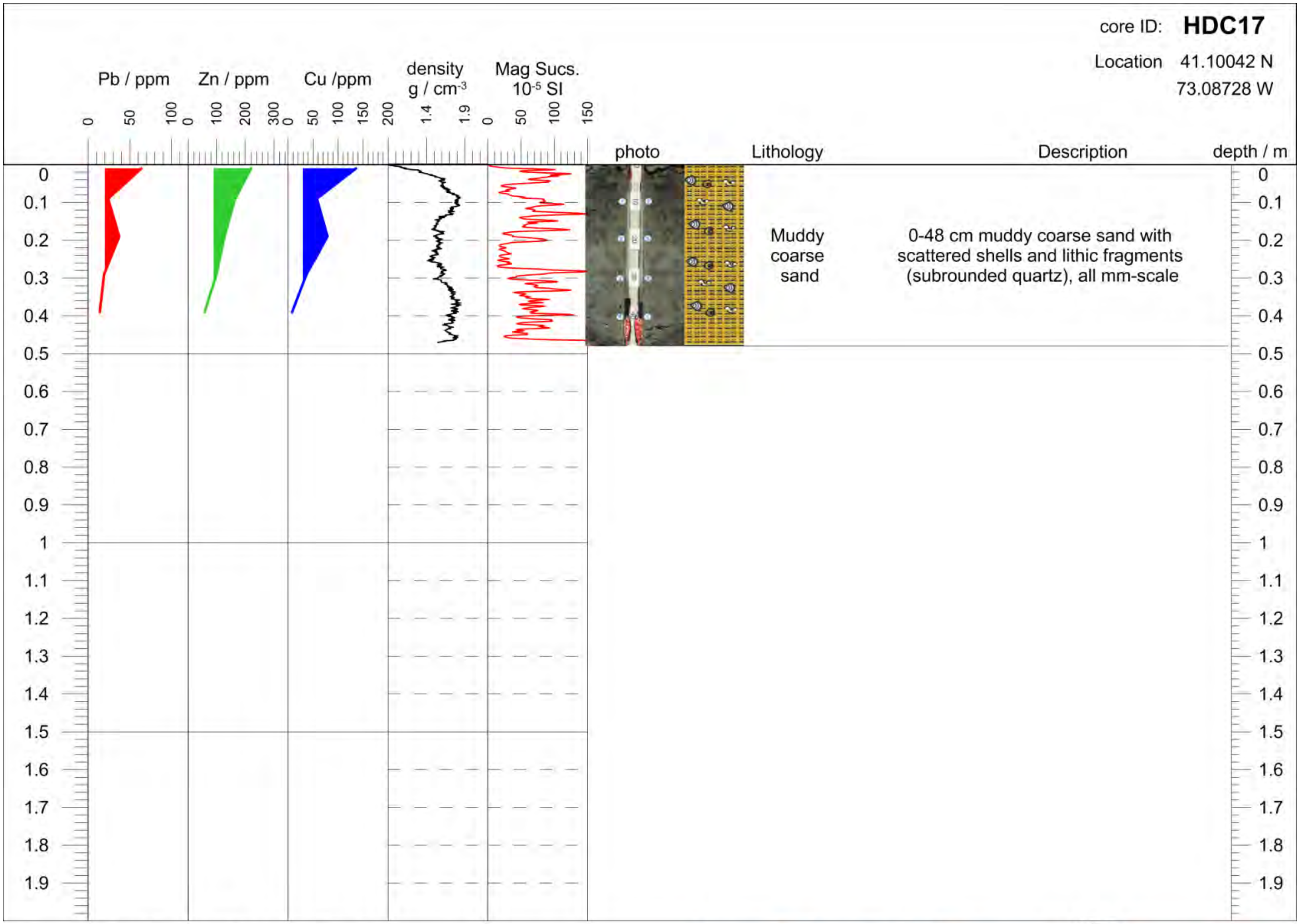
core ID: **HDC17**

Location 41.10042 N
73.08728 W



0-48 cm muddy coarse sand with scattered shells and lithic fragments (subrounded quartz), all mm-scale

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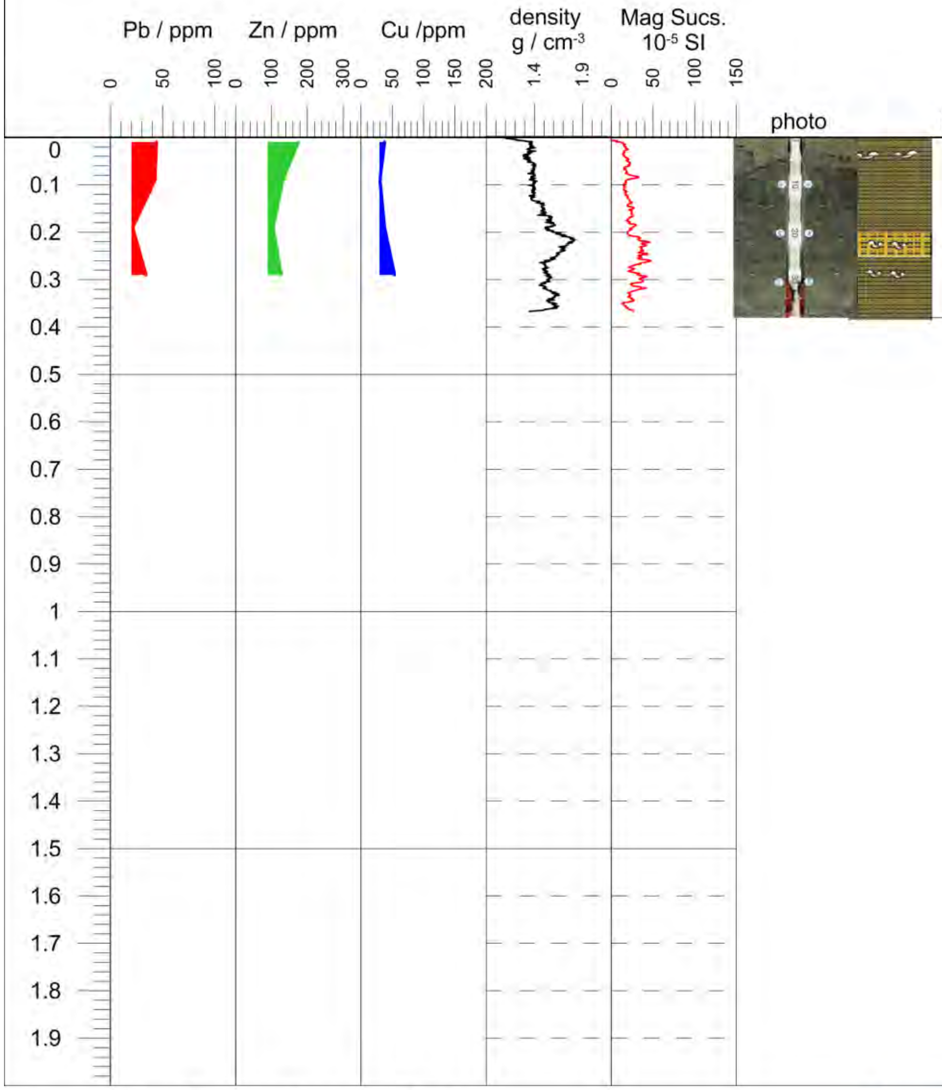
core ID: **HDC18**

Location 41.04467 N
73.00448 W



Lithology	Description	depth / m
Coarse sandy mud	2-5 cm scattered gastropod shell fragments and lithic clasts (shale) at mm-scale. 21 - 25 cm coarse sand beds with brachiopod shell fragments. 2529 cm shell fragments.	0 – 0.4

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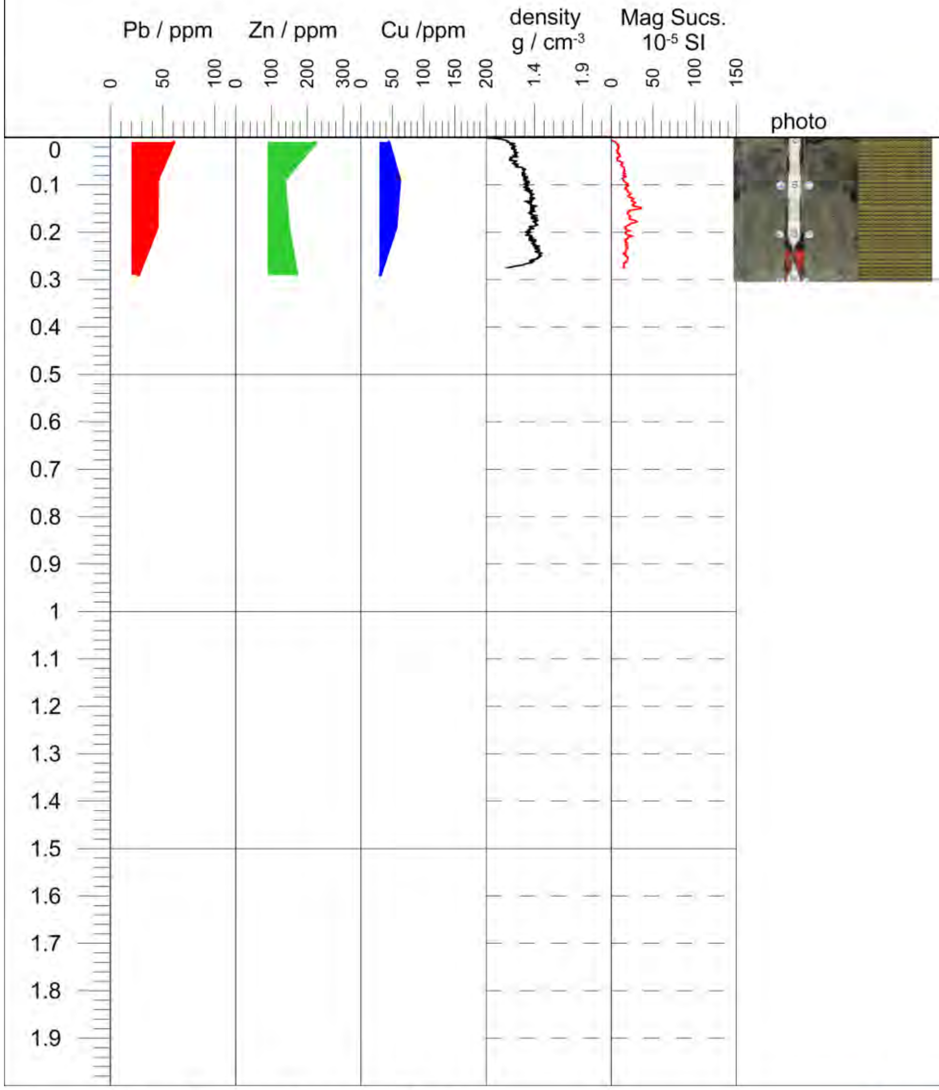
core ID: **HDC19**

Location 41.02703 N
72.95763 W



Lithology	Description	depth / m
Mud	0-30 cm, homogeneous mud. At 18 cm tube worm.	0–0.3

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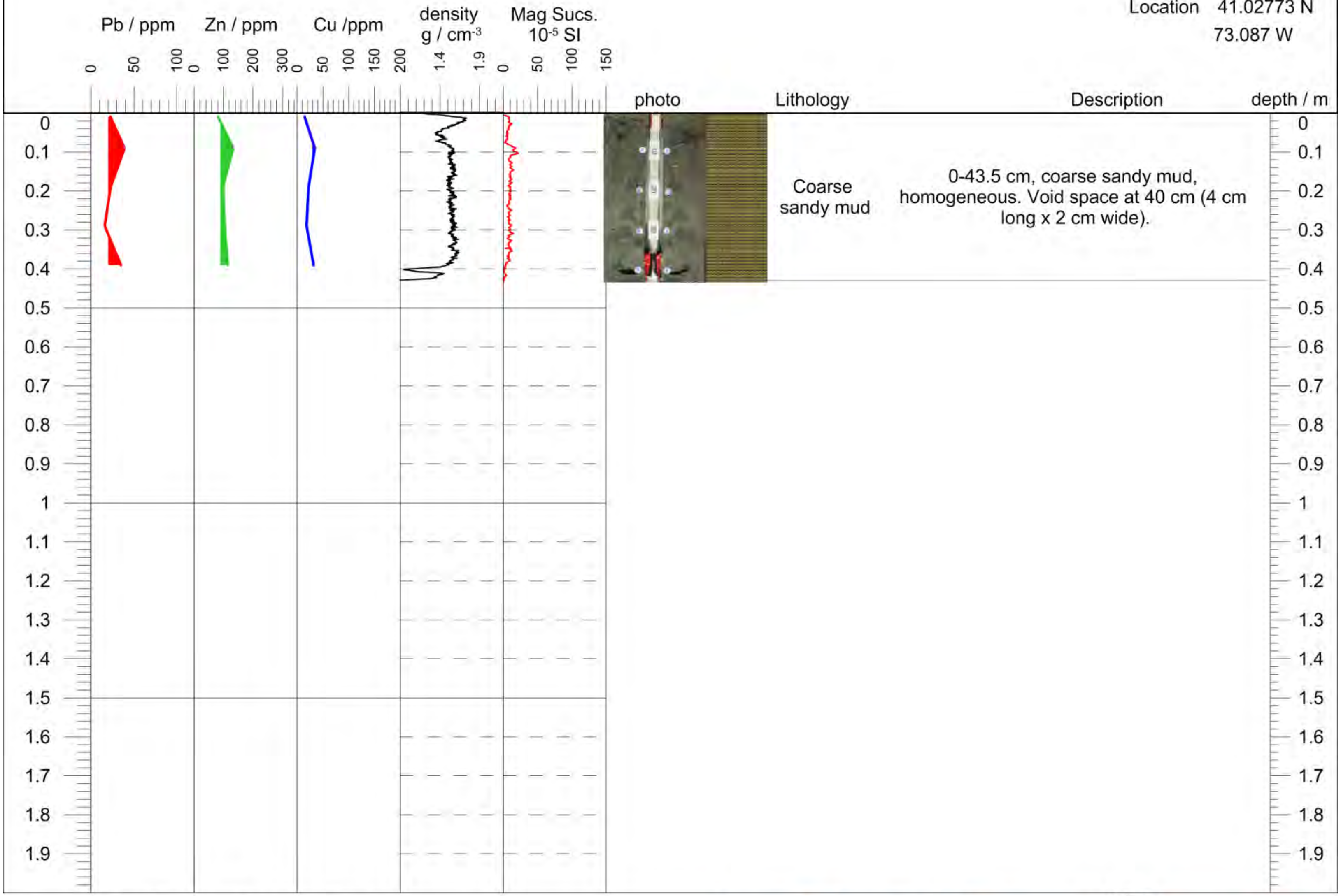
core ID: **HDC20**

Location 41.02773 N
73.087 W



Lithology: Coarse sandy mud

Description: 0-43.5 cm, coarse sandy mud, homogeneous. Void space at 40 cm (4 cm long x 2 cm wide).

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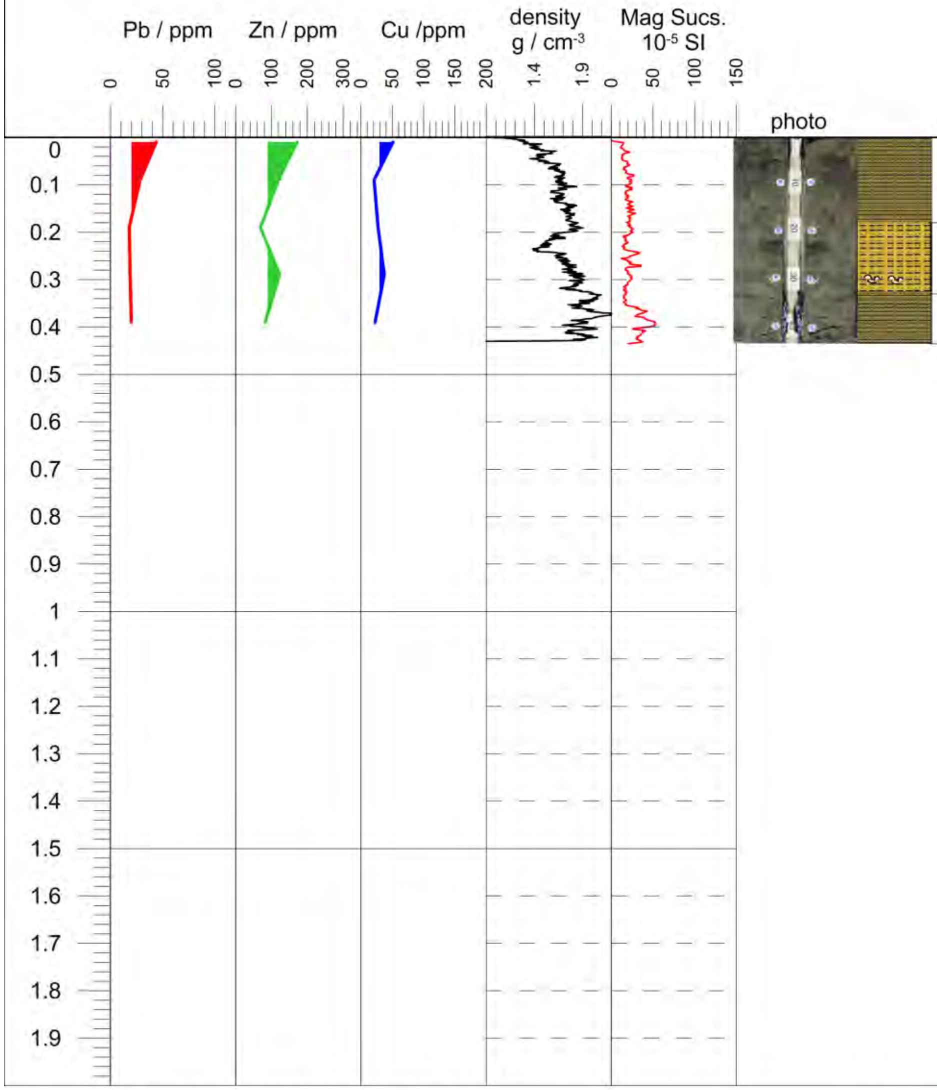
core ID: **HDC21**

Location 41.04043 N
73.08277 W



Lithology	Description
Coarse sandy mud	0-18 cm, coarse sandy mud.
Muddy sand	18-33 cm muddy sand. 30 cm, rare shell fragments
Coarse sandy mud	33-43.5 cm, coarse sandy mud

depth / m

0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
1.1
1.2
1.3
1.4
1.5
1.6
1.7
1.8
1.9

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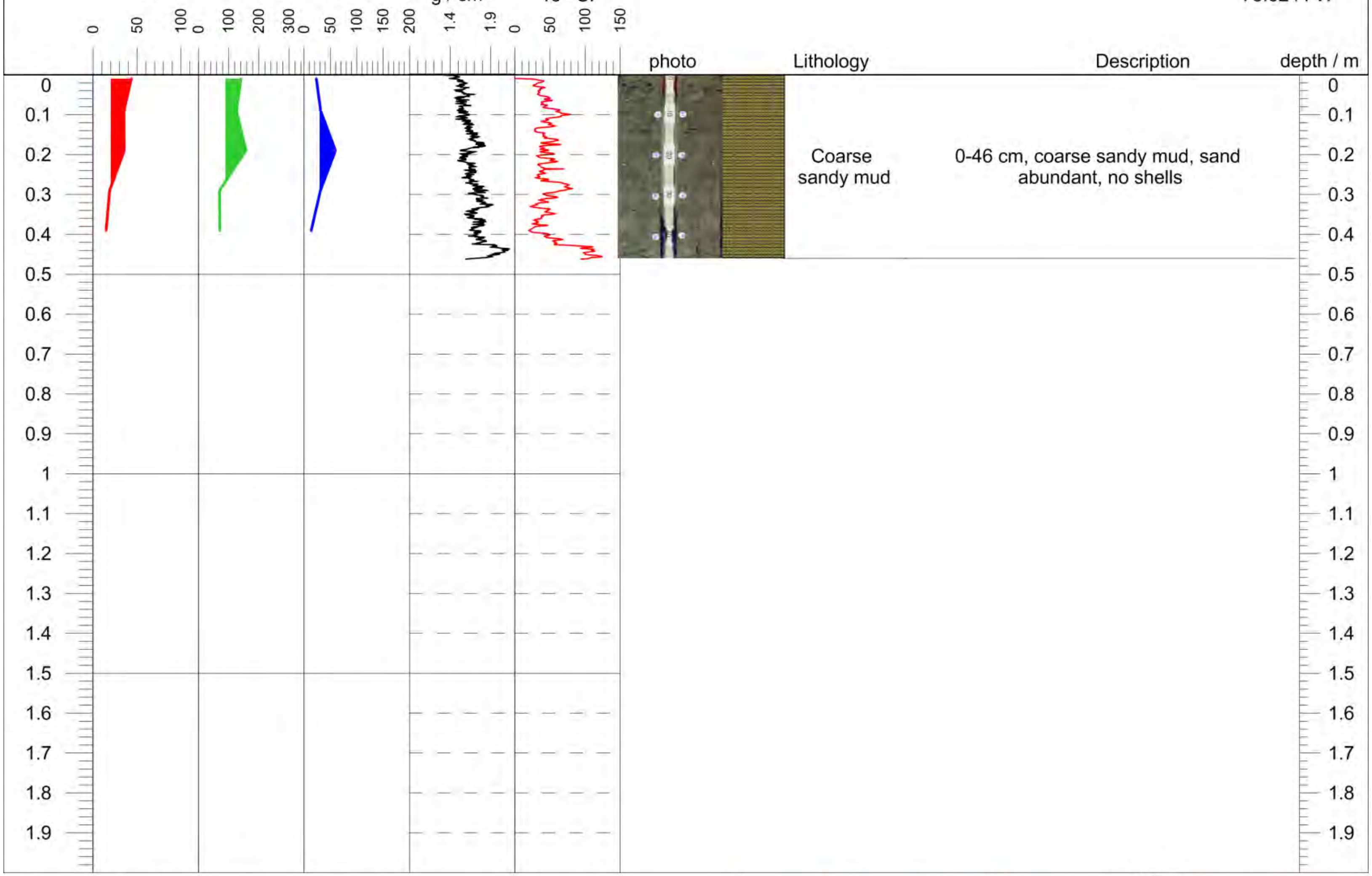
core ID: **HDC22**

Location 41.03238 N
73.0244 W



Coarse sandy mud

0-46 cm, coarse sandy mud, sand abundant, no shells

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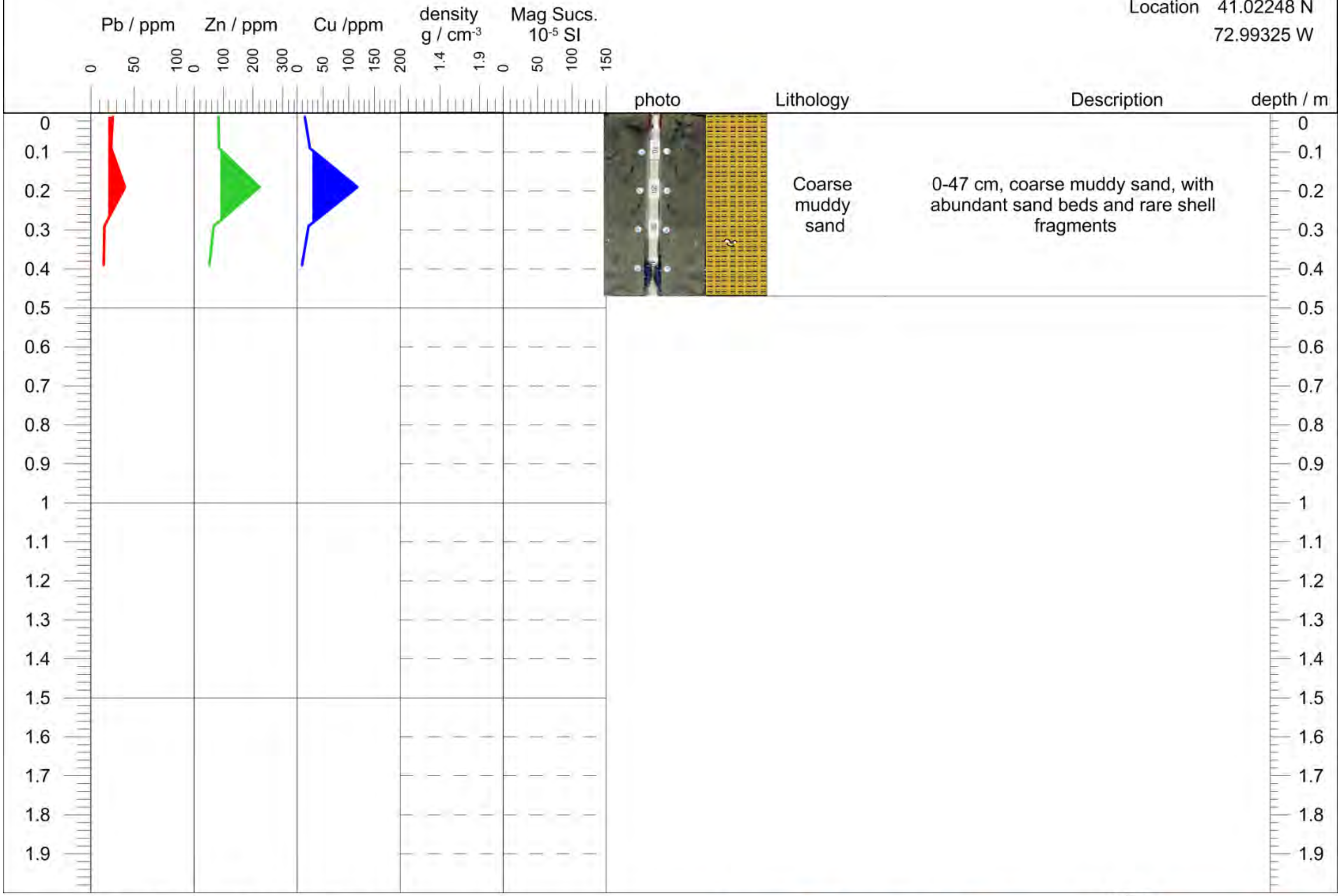
core ID: **HDC23**

Location 41.02248 N
72.99325 W



0-47 cm, coarse muddy sand, with abundant sand beds and rare shell fragments

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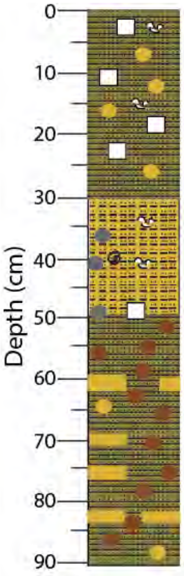
Appendix 8 – Sediment Core Descriptions

As part of the pilot of the Long Island Sound mapping project we collected 46 sediment cores. The main text of the report (section 4.4) describes the details of the core analysis and presents examples of the findings of the sediment cores. In this appendix we present the descriptions.

SEAWOLF 13-03-GC01

Latitude: 40° 59.533′ N Longitude: 73° 05.550′ W
Core length: 90 cm Water Depth: 28.8 m
Date taken: 06/05/13
Date described: 9/20/13
Described by: McHugh Flow-in: no



0-30 cm [Medium sandy mud], heavily bioturbated (10Y3/1), with small (mm scale)shell fragments and floating lithic clasts. The lithic clasts are at 1, 13, 20, 27 cm, subrounded to subangular, mm's to 1 cm long (gray, beige, white).

30-50 cm [Medium muddy sand], heavily bioturbated (10Y2.5/1) with floating clay cats, lithic clasts, shells and shell fragments. Gastropod shell 2 cm long at 40 cm. This interval contains fewer lithc clasts than 0-39 cm above but more clay clasts at 35 cm, 40 cm and 50 cm.

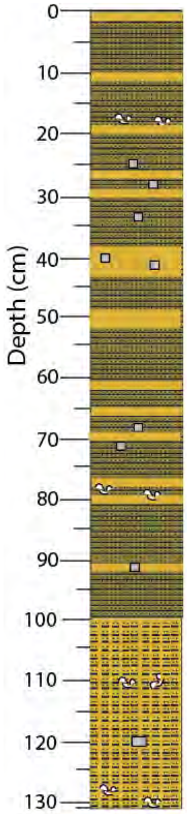
50 - 90 cm [Medium sandy mud], heavily bioturbated (10Y3/1) sandy mud with coarse grained sand beds, lenses and laminae up to 4 cm tick. Sand is coarse grained and contains shell fragments. The heavy bioturbation cross-cuts the sand beds.

SEAWOLF 13-03-GC02

Latitude: 41° 01.231′ N
Core length: 130.5 cm
Date taken: 06/05/13
Date described: 11/01/13
Described by: McHugh

Longitude: 73° 07.762′ W
Water Depth: 45.6m

Flow-in: no



0-131.5 cm [Moderately bioturbated mud containing coarse sand pockets and beds]

Coarse sand beds at 0-2 cm, 10-11 cm, 18-19 cm (contains shells and fragments up to 1.5 cm long.
26-28 cm contains several lithic clasts: 1 cm long, subrounded and angular.

34-36 cm, 1.5 cm long subrounded lithic clast.
38 - 44 cm, coarse sand bed with lithic clasts

49- 52 cm, coarse sand

56 - 60 cm coarse sand lenses
63 - 66 cm, coarse sand bed with lithic clast
69 - 72 cm, coarse sand bed with angular lithic clasts
78 - 80 cm, coarse sand bed, shells some intact with two valves (clam), few shell fragments.
85 - 90 cm, coarse sand lense
91 - 93 cm coarse sand bed and lithic clast 0.5 cm long

From 100 - 131.5 cm, interbedded coarse sand and sandy mud.

At 110 cm scattered red shells.

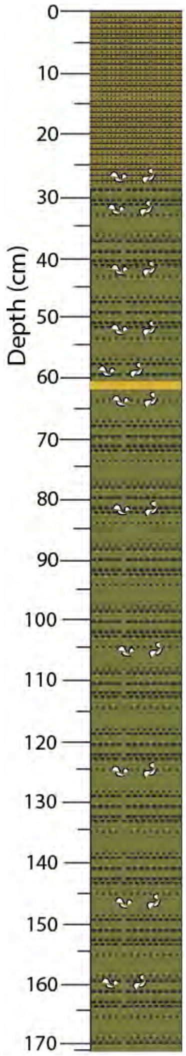
120 cm, 1 cm long angular lithic clast.
At 128 cm shell fragments.

KEY

- 🟩 silty clay
- ▨ clayey silt
- ▨ sandy mud
- ▨ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- ■ woody material
- □ lithics
- ~ shell fragments
- ◎ shells
- — sharp contact

SEAWOLF 13-03-GC03

Latitude: 41° 02.153’ N
Longitude: 73° 09.283’ W
Core length: 171.5 cm
Water Depth: 31.6 m
Date taken: 06/05/13
Date described: 11/01/13
Described by: McHugh
Flow-in: no



0 - 27 cm [Sandy mud]
Pocketts of shells and shell fragments: 24 - 27 cm.

27 - 171.5 cm [Mud]
Scattered shells at: 33 cm, 42 cm, 50 cm, 55 cm, 58 cm, 63 cn, 83 cm, 105 cm, 125 cm, 160 cm.

V f. sand bed 62 - 63 cm

The core is mottled due to heavy bioturbation.

KEY

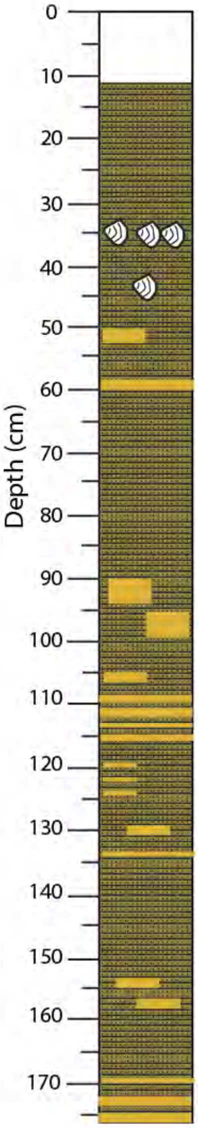
- 🟩 silty clay
- ▤ clayey silt
- ▤ sandy mud
- ▦ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- ■ woody material
- ▫ lithics
- ∾ shell fragments
- ◎ shells
- — sharp contact

SEAWOLF 13-03-GC04

Latitude: 41° 03.520′ N
Core length: 175.5 cm
Date taken: 06/05/13
Date described: 12/17/13
Described by: McHugh

Longitude: 73° 09.489′ W
Water Depth: 23.2 m

Flow-in: no



0 - 12 cm Void

12 - 91 cm [Mud moderately bioturbated]

35 36 cm clam bed, clams with both valves.

At 43-44 cm a 3.5 long clam shell, well-preserved.

Rare medium sand lense (52-53 cm) laminae (59-60 cm).

91 - 175.5 cm [Mud with sand beds and lenses]
91 - 95 cm, coarse sand lense (rich in mica); 95-96 cm, 105-106 cm.

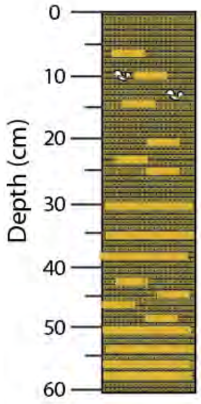
109-113 cm, five coarse sand beds

120 - 125 cm, three coarse sand laminae.
131-132 cm coarse sand lense
133 cm coarse sand laminae

157 - 158 cm coarse sand lenses
170 cm, coarse sand laminae
174 - 175.5 cm, coarse sand beds

SEAWOLF 13-03-GC05

Latitude: 41° 03.018′ N
Longitude: 73° 08.349′ W
Core length: 60 cm
Water Depth: 26.7 m
Date taken: 06/05/13
Date described: 12/17/13
Described by: McHugh
Flow-in: no



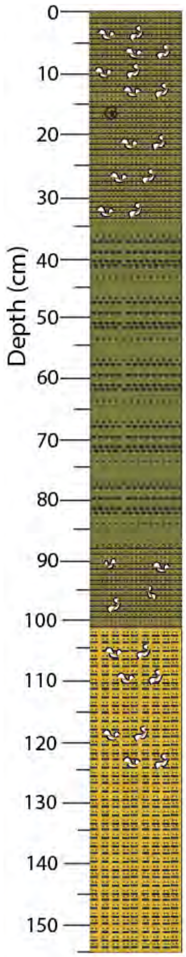
0 - 60 cm [Micaceous, coarse sandy mud]
Sand beds and lenses common
lenses: 7-8 cm, 10-11 cm, 14-15 cm, 20-21 cm, 23-24 cm, 26-27 cm, 44-50 cm
beds: 30-31 cm, 35-36 cm, 38-39 cm, 50-60 cm
laminae 40-44 cm
Rare scattered shell fragments at 11 and 13 cm, mm-scale

KEY

🟩 silty clay
🟩 clayey silt
▤ sandy mud
▦ muddy sand
🟨 sand
● mottles-bioturbation
■ woody material
□ lithics
~ shell fragments
◎ shells
— sharp contact

SEAWOLF 13-03-GC06

Latitude: 41° 04.813′ N
Longitude: 73° 07.547′ W
Core length: 155 cm
Water Depth: 35.0 m
Date taken: 06/05/13
Date described: 12/15/13
Described by: McHugh
Flow-in: no



0 - 18 cm [Shelly sandy mud]
Contains shell fragments (mm-scale) and shells.
There is a 2 cm long mussle shell.
18 - 35 cm shelly mud the shell fragments decrease in abudance towards 35 cm.

35 - 87 cm [Homogeneous mud]

87 - 103 cm, shelly sandy mud. Shells are mosly fragments and constitute ~10% of the interval.

103- 110 cm, coarse sand beds.

110 - 123 cm, sandy mud with scattered shells and fragments. At 117 - 118 cm a clam shell well-preserved.

123 - 155 cm coarse sand beds and lenses.

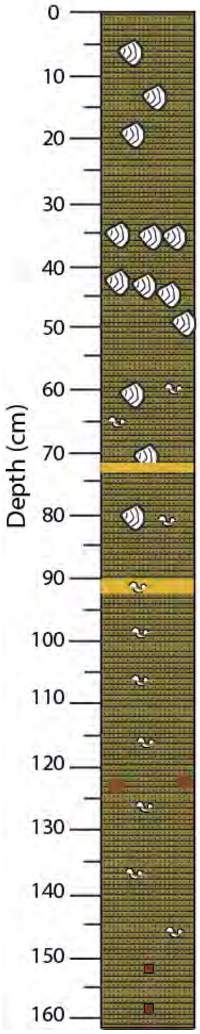
147 - 153 cm a gastropod shell fragment.

KEY

🟩	silty clay	●	mottles-bioturbation
▨	clayey silt	■	woody material
▨	sandy mud	□	lithics
▨	muddy sand	∿	shell fragments
🟨	sand	◎	shells
		—	sharp contact

SEAWOLF 13-03-GC07

Latitude: 41° 05.408′ N
Longitude: 73° 08.402′ W
Core length: 161 cm
Water Depth: 18.7 m
Date taken: 06/05/13
Date described: 9/23/13
Described by: McHugh
Flow-in: no



0 - 161 cm [Sandy mud]
0-30 cm, sandy mud, heavily bioturbated with scattered clam shells, well preserved and mm long.

30 - 60 cm shelly sandy mud, heavily bioturbated, with abundant well preserved clam shells, mm's to 1 cm long. This interval contains clam shell beds up to 10 cm long between 30 - 40 cm and 40 -50 cm. Part of the 40 - 50 cm bed apparently was dragged along the sides of the core and displaced downcore to 55 - 60 cm.

60 - 81 cm sandy mud with rare scattered clam shells and shell fragments.
72 - 73 cm coarse sand bed

81 - 161 cm, sandy mud, moderately bioturbated with scattered, rare shell frragments 1 mm to 1.5 cm long.

90-93 cm, coarse sand bed with shell fragments.

123 cm dark stain (10B2.5/1) possibly due to organic matter.

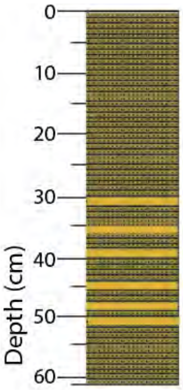
There is woody material at 152 cm and 160 cm

KEY

🟩	silty clay	●	mottles-bioturbation
🟩	clayey silt	■	woody material
▨	sandy mud	□	lithics
▨	muddy sand	~	shell fragments
🟨	sand		shells
		—	sharp contact

SEAWOLF 13-03-GC08

Latitude: 41° 01.975′ N
Longitude: 73° 03.595′ W
Core length: 61.5 cm
Water Depth: 39.4 m
Date taken: 06/06/13
Date described: 12/15/13
Described by: McHugh
Flow-in: no



0 - 61.5 cm [Coarse sandy mud]

Sand beds at 31-32 cm, 37 cm, 39 cm, 44-53 cm.

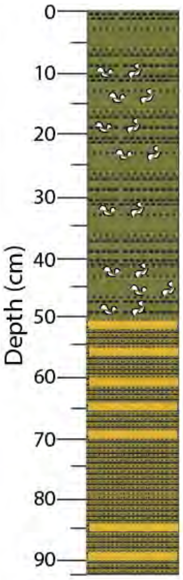
Very rare scattered shells

KEY

- 🟩 silty clay
- ▨ clayey silt
- ▨ sandy mud
- ▨ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- ■ woody material
- □ lithics
- ∾ shell fragments
- @ shells
- — sharp contact

SEAWOLF 13-03-GC09

Latitude: 41° 05.792′ N
Longitude: 73° 03.040′ W
Core length: 93.5 cm
Water Depth: 23.0 m
Date taken: 06/06/13
Date described: 12/15/13
Described by: McHugh
Flow-in: no



0 - 50 cm [Mud]

9 - 33 cm, mud with scattered shell fragments up to 2 cm long

45 - 50 cm, mud with scattered shell fragments, mm-long

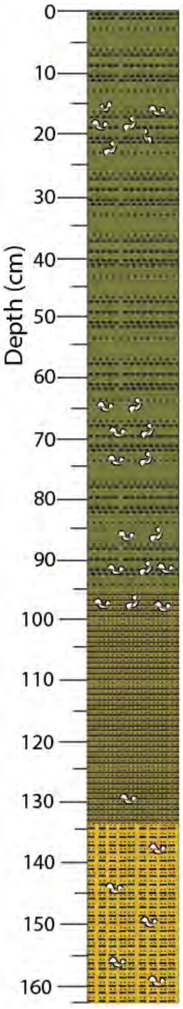
50 - 93.5 cm [Sandy mud with coarse sand bed and lenses]

KEY

- 🟩 silty clay
- ▨ clayey silt
- ▨ sandy mud
- ▨ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- 🟥 woody material
- ▫ lithics
- ∿ shell fragments
- @ shells
- — sharp contact

SEAWOLF 13-03-GC10

Latitude: 41° 05.257′ N Longitude: 73° 04.454′ W
Core length: 163 cm Water Depth: 30.0 m
Date taken: 06/06/13
Date described: 12/15/13
Described by: McHugh Flow-in: no



0 - 95 cm [Mud and shelly mud beds]
0-15 cm mud

15 - 22 cm shelly mud with mostly shell fragments mm-scale

64 - 74 cm, 85 - 99 cm, shelly mud with mostly shell fragments mm-scale

95 - 134 cm [Coarse sandy mud with scattered sand laminae, lenses and shell fragments]

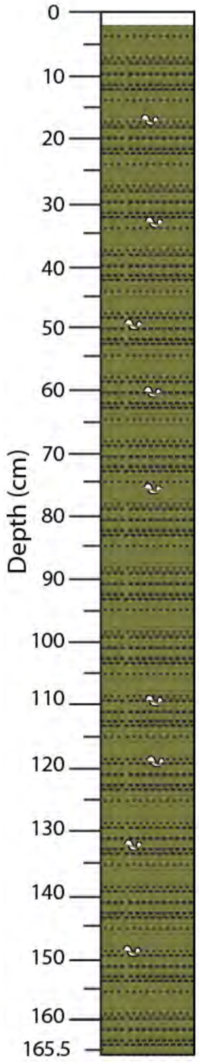
134 - 163 cm [Muddy sand and laminae]
Laminae abundant, muddy sand contains scattered shell fragments mm-scale, rare shell fragments up to 1 cm long

KEY

🟩	silty clay	●	mottles-bioturbation
▨	clayey silt	■	woody material
▨	sandy mud	■	lithics
▨	muddy sand	∿	shell fragments
🟨	sand	◎	shells
		—	sharp contact

SEAWOLF 13-03-GC11

Latitude: 41° 04.411′ N	Longitude: 73° 02.657′ W
Core length: 165.5 cm	Water Depth: 27.4 m
Date taken: 06/06/13	
Date described: 12/27/13	
Described by: McHugh	Flow-in: no



0-2 cm Void

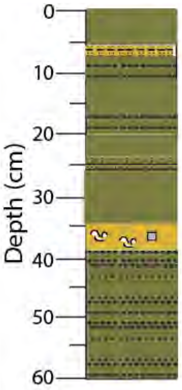
2 - 165.5 cm [Mud]
Contains rare scattered shell fragments.
.

KEY

🟩	silty clay	●	mottles-bioturbation
▨	clayey silt	■	woody material
▨	sandy mud	▫	lithics
▨	muddy sand	~	shell fragments
🟨	sand		shells
		—	sharp contact

SEAWOLF 13-03-GC12

Latitude: 41° 07.731′ N	Longitude: 73° 11.226′ W
Core length: 60 cm	Water Depth: 12.1 m
Date taken: 06/10/13	
Date described: 9/23/13	
Described by: McHugh	Flow-in: no



0 - 60 cm [Clay, mud, sand beds]
6 - 8 cm, muddy sand bed
8 - 60 cm, mud

25 - 26 cm, sandy mud bed

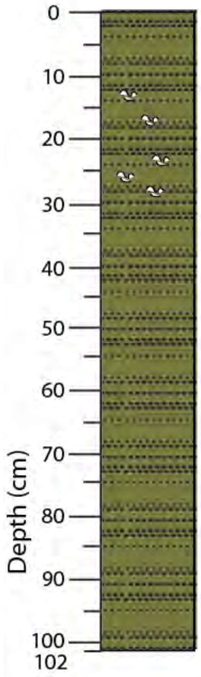
36 - 39 cm, sand bed containing shell fragments (up to 2 cm long) and lithic clasts.
40 - 60 cm, homogeneous mud

KEY

🟩	silty clay	●	mottles-bioturbation
▨	clayey silt	■	woody material
▤	sandy mud	□	lithics
▦	muddy sand	∿	shell fragments
🟨	sand	@	shells
		—	sharp contact

SEAWOLF 13-03-GC13

Latitude: 41° 06.533′ N
Longitude: 73° 09.953′ W
Core length: 102 cm
Water Depth: 14.2 m
Date taken: 06/10/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



0-102 cm [Mud]

8-30 cm abundant clam shells and fragments.
Mostly well preserved, mm to 1 cm long Mullimina sp.

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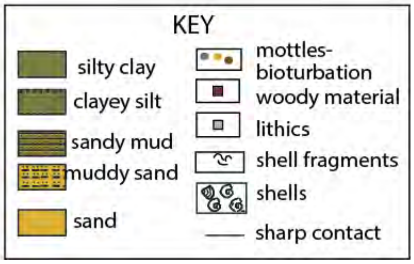


SEAWOLF 13-03-GC14

Latitude: 41° 06.012′ N

Longitude: 73° 09.013′ W

Core length: 72 cm

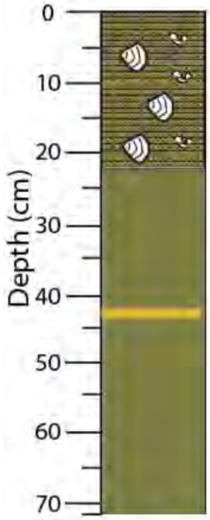
Water Depth: 15.5 m

Date taken: 06/10/13

Date described: 9/27/13

Described by: McHugh

Flow-in: no

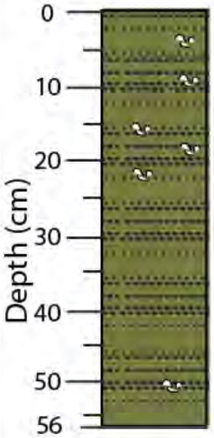


0 - 22 cm [Sandy mud]
Sandy mud contains abundant shells and shell fragments. Shells are dominated by M. lateralis. The shells range in size from a few mm's to1 cm long. Some are well preserved including two valves.

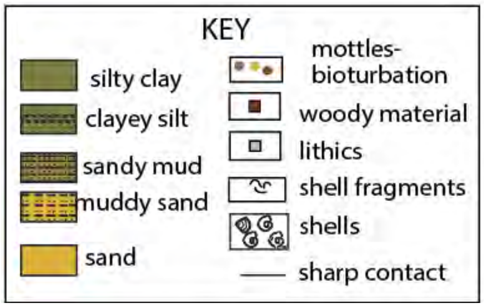
22 - 72 cm [Clay]
Clay beds 1 - 2 cm thick, variegated colors of gray.
Sand bed at 42 - 43 cm

SEAWOLF 13-03-GC15

Latitude: 41° 04.958′ N
Longitude: 73° 10.015′ W
Core length: 56 cm
Water Depth: 19.8 m
Date taken: 6/10/13
Date described: 9/27/13
Described by: McHugh
Flow-in: no

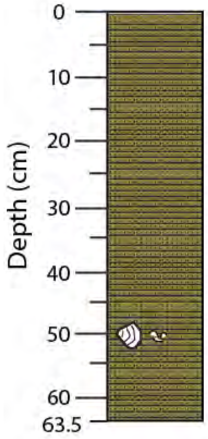


0 - 56 cm [Clayey silt]
Heavily bioturbated clayey silt
with rare shell fragments.

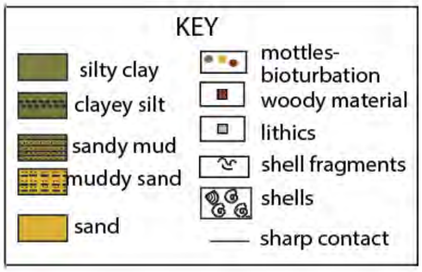


SEAWOLF 13-03-GC16

Latitude: 41° 00.661′ N
Longitude: 73° 08.324′ W
Core length: 63.5 cm
Water Depth: 40.2 m
Date taken: 06/11/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no

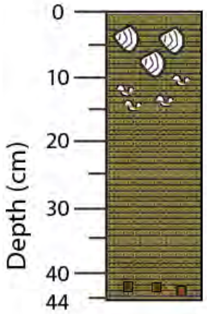


0 - 63.5 cm [Coarse sandy mud]. Sand is scattered in the mud.
Large (3 cm) mollusk shell at 50 cm.



SEAWOLF 13-03-GC17

Latitude: 40° 57.588′ N
Longitude: 73° 04.852′ W
Core length: 44 cm
Water Depth: 7.8 m
Date taken: 06/11/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



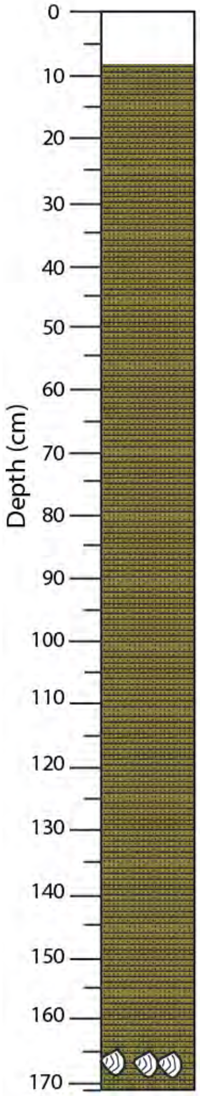
0 - 15 cm [Medium sandy shelly mud].
0- 7 cm, abundant clam shells well preserved (2 valves)
up to 1 cm
7 - 15 cm mostly clam shell fragments mm-scale
15 - 39 cm mud
39 - 44 cm [Mud with coal and coal byproducts (slag)]
Coal up to 3 cm long.

KEY

- 🟩 silty clay
- ▨ clayey silt
- ▨ sandy mud
- ▨ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- ■ woody material coal - slag
- □ lithics
- ∼ shell fragments
- ◎ shells
- — sharp contact

SEAWOLF 13-03-GC18

Latitude: 41° 05.157′ N
Longitude: 73° 04.461′ W
Core length: 171.4 cm
Water Depth: 34.1 m
Date taken: 6/11/13
Date described: 12/17/13
Described by: McHugh
Flow-in: no



0 - 8 cm void

8 - 171.4 cm [Mud moderately bioturbated]

8 - 100 cm rare scattered shell fragments, mm scale, also whole clam shells including < mmm clams with two valves

55 - 90 cm heavy bioturbation

100 - 130 cm, color banding light and dark olive green

130 - 150 cm abundant gas escape features

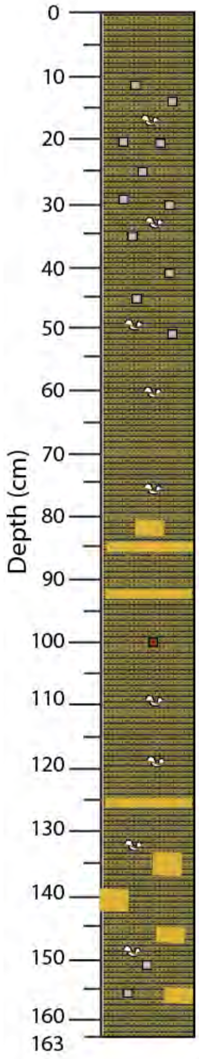
168 - 169 cm clam bed, shells mm-scale

KEY

🟩	silty clay	●	mottles-bioturbation
🟩	clayey silt	■	woody material
▤	sandy mud	□	lithics
▦	muddy sand	~	shell fragments
🟨	sand		shells
		—	sharp contact

SEAWOLF 13-03-GC19

Latitude: 41° 04.327′ N
Longitude: 73° 04.475′ W
Core length: 163 cm
Water Depth: 25.8 m
Date taken: 6/11/13
Date described: 9/26/13
Described by: McHugh
Flow-in: no



0 - 10 cm [Sandy mud, moderate bioturbation and mottling]

0 - 10 cm sandy mud disturbed during either coring or splitting of core.

10 - 52 cm [Gravelly sandy mud]

Contains floating lithic clasts, subangular
to subrounded and mainly composed of quartz
Some intervals contain more lithic clasts than others:
10 - 20 cm less abundant and only a few mm in size.
20 - 52 cm lithic clasts more abundant than 10-20 cm and up to 2 cm long.
20 - 52 cm scattered shell fragments.

52 - 163 cm [Mud with coarse sand beds and lenses]
Contains scattered a few mm's long shell fragments, moderate bioturbation and mottling.

Disseminated lenses of coarse sand (80-82 cm, 134 - 137 cm, 139 - 149 cm)
Coarse sand beds (85-86 cm, 93-98 cm, 125 - 130 cm)

Woody material at 98 cm

Gravel-size lithic clasts at 150 and 155 cm

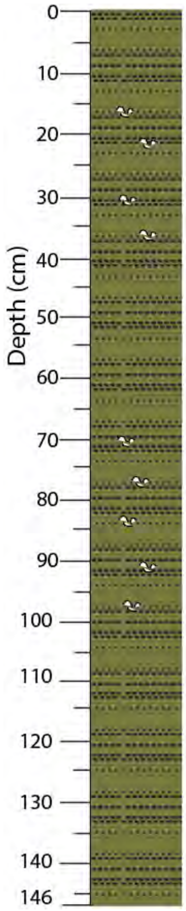
Pebbly, coarse sand pocket at 158 - 160 cm.

KEY

🟩 silty clay
🟩 clayey silt
▤ sandy mud
▦ muddy sand
🟨 sand
● mottles-bioturbation
■ woody material
□ lithics
~ shell fragments
◎ shells
— sharp contact

SEAWOLF 13-03-GC20

Latitude: 41° 03.920′ N
Longitude: 73° 02.759′ W
Core length: 146 cm
Water Depth: 30.4 m
Date taken: 6/11/13
Date described: 9/26/13
Described by: McHugh
Flow-in: no



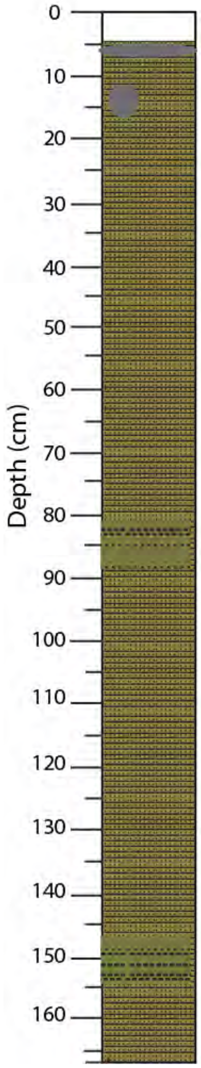
0-146 cm [Heavily to moderately bioturbated mud scattered with shells and shell fragments]
0 - 60 cm heavy bioturbation
60 - 146 cm modearte bioturbation
18 - 20 cm, 30 - 35 cm, 70 - 100 cm shells and shell fragments most abundant

KEY

- 🟩 mud
- ▨ silty clay
- ▨ clayey silt
- 🟨 sand
- ▨ muddy sand
- ● mottles-bioturbation
- 🟥 woody material
- ▫ lithics
- ∾ shell fragments
- @ shells
- — sharp contact

SEAWOLF 13-03-GC21

Latitude: 41° 03.509′ N
Longitude: 73° 01.622′ W
Core length: 167 cm
Water Depth: 35.4 m
Date taken: 06/11/13
Date described: 12/17/13
Described by: McHugh
Flow-in: no



0 - 4 cm void

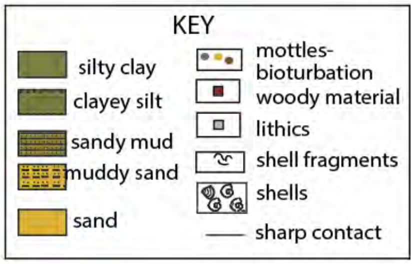
4- 167 cm [Mud, very rare scattered shell fragments mm-scale]

Dark gray mottles 5 - 6 cm and 11-17 cm

Rare scattered shell fragments at 42 cm, 54 cm, 64 cm

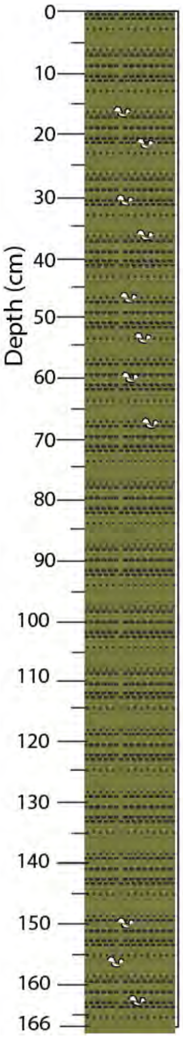
83 - 96 cm, coarse silt mud interval

147 - 155 cm, coarse silt mud interval



SEAWOLF 13-03-GC22

Latitude: 41° 00.589’ N
Longitude: 73° 01.472’ W
Core length: 166.5 cm
Water Depth: 29.0 m
Date taken: 6/12/13
Date described: 10/2//13
Described by: McHugh
Flow-in: no



0-166.5 cm [Mud, heavily to moderately bioturbated with scattered shell fragments]

0 - 60 cm moderate bioturbation

60 - 166 cm heavy bioturbation

Shell fragments at 19 cm, 30 - 40 cm, 50 cm, 60 - 65 cm, 152 - 164 cm

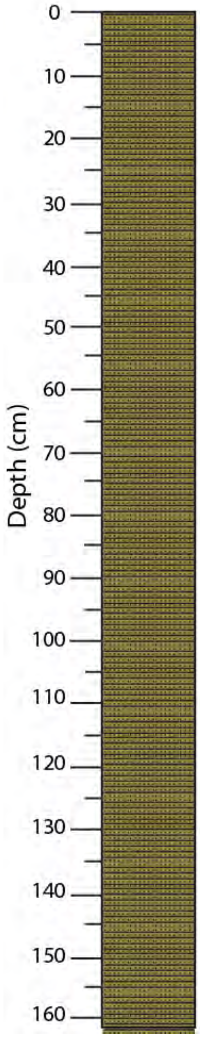
Sand pocket 110 cm

KEY

🟩	mud	●	mottles-bioturbation
▨	silty clay	■	woody material
▤	clayey silt	□	lithics
🟨	sand	∾	shell fragments
▦	muddy sand	◎	shells
		—	sharp contact

SEAWOLF 13-03-GC23

Latitude: 40° 59.762′ N
Longitude: 73° 02.218′ W
Core length: 128 cm
Water Depth: 24.1 m
Date taken: 6/12/13
Date described: 9/26/13
Described by: McHugh
Deformation: upper 20 cm due to splitting



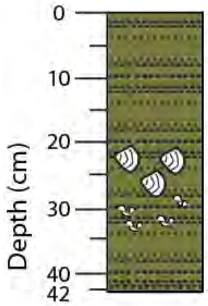
0 - 128 cm [Sandy mud]
0-20 cm, sandy mud, disturbed due to extrusion and/or splitting.
Sandy mud contains scattered shell fragments most common at 15-25 cm, 65 - 70 cm.
At 35 cm a clam a few mm long in life position with two valves.
At 39 cm, 9 cm long clam shell.
From 30 to 128 cm heavy bioturbation, mud has been homogenized by bioturbation.
Dark mottling possibly due to organics at 82-83 cm, 98 - 103 cm, 115 - 120 cm, 127-128 cm.

KEY

- 🟩 silty clay
- 🟩 clayey silt
- ▤ sandy mud
- ▦ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- ■ woody material
- ▫ lithics
- ~ shell fragments
- ◎ shells
- — sharp contact

SEAWOLF 13-03-HDC-01

Latitude: 41° 03.586′ N Longitude: 73° 09.549′ W
Core length: 42 cm Water Depth: 22.7 m
Date taken: 06/05/13
Date described: 12/27/13
Described by: McHugh Flow-in: no



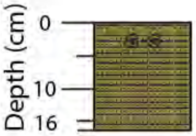
0 - 42 cm [Mud, rich in coarse silt].
0 - 10 cm, gas escape features, worm track
10 - 23 m, mud
23-35 cm scattered clam shells up to 1 cm long wome with two valves, most well-preserved. Although shell fragments are also present
35 - 42 cm mud

KEY

🟩 silty clay
▤ clayey silt
▦ sandy mud
▤ muddy sand
🟨 sand
● mottles- bioturbation
■ woody material coal - slag
□ lithics
~ shell fragments
@ shells
— sharp contact

SEAWOLF 13-03-HDC-02

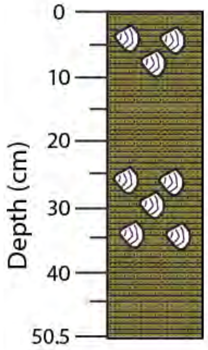
Latitude: 41° 04.215′ N
Longitude: 73° 04.656′ W
Core length: 16 cm
Water Depth: 22.5 m
Date taken: 06/06/113
Date described: 12/27/13
Described by: McHugh
Flow-in: no



0 - 16 cm [Medium sandy mud]
Abundant gas escape features
1 to 2 cm long, well-preserved gastropod tests, no clams

SEAWOLF 13-03-HDC03

Latitude: 41° 06.711′ N
Longitude: 73° 04.791′ W
Core length: 50.5 cm
Water Depth: 17.2 m
Date taken: 06/06/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



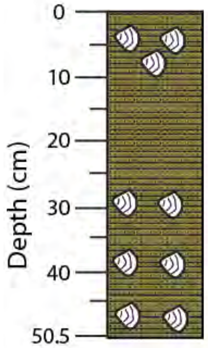
0 - 50.5 cm [Medium, sandy shelly mud].
Shells form beds at 0 - 12 cm and 26 - 37 cm
Shells are dominated by clams

KEY

🟩	silty clay	▨	mottles-bioturbation
▨	clayey silt	■	woody material
		▫	coal - slag
		▫	lithics
▨	sandy mud	~	shell fragments
▨	muddy sand	◎	shells
🟨	sand	—	sharp contact

SEAWOLF 13-03-HDC04

Latitude: 41° 07.804′ N
Longitude: 73° 05.526′ W
Core length: 50.5 cm
Water Depth: 13.7 m
Date taken: 06/06/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



0 - 50.5 cm [Medium, sandy shelly mud]
Shells are dominated by clams (mm-scale), well-preserved, and form beds at 0 - 12 cm, 30-31 cm, 39-40cm, 42-44 cm, and 46-49 cm

KEY

- 🟩 silty clay
- ▨ clayey silt
- ▨ sandy mud
- ▨ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- ■ woody material coal - slag
- □ lithics
- ~ shell fragments
- @ shells
- — sharp contact

SEAWOLF 13-03-HDC05

Latitude: 41° 08.303′ N

Longitude: 73° 05.148′ W

Core length: 40.5 cm

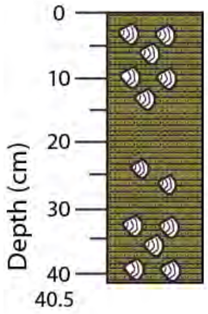
Water Depth: 13.2 m

Date taken: 06/06/13

Date described: 12/27/13

Described by: McHugh

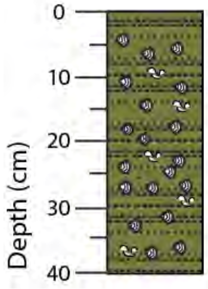
Flow-in: no



0 - 40.5 cm [Medium, sandy shelly mud].
Shells are dominated by clams, mostly mm-scale but up to 2.5 cm long.
Shells are well-preserved and form beds at
0 - 20 cm (very abundant), 20-30 cm (scattered), 30-40 cm abundant

SEAWOLF 13-03-HDC06

Latitude: 41° 08.702′ N
Longitude: 73° 04.353′ W
Core length: 40 cm
Water Depth: 13.2 m
Date taken: 06/06/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



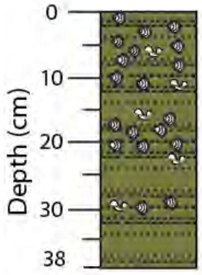
0 - 40 cm [Shelly mud].
Shells are dominated by clams, mostly mm-scale and well-preserved.
Shells and shell fragments are scattered throughout
and constitue 20% of the core

KEY

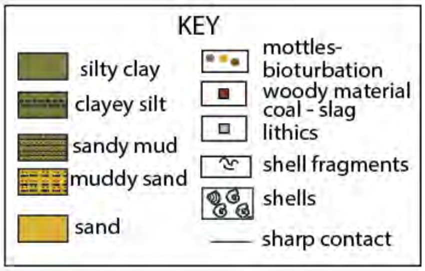
▆ silty clay
▤ clayey silt
▤ sandy mud
▦ muddy sand
▆ sand
● mottles-bioturbation
■ woody material coal - slag
□ lithics
~ shell fragments
@ shells
— sharp contact

SEAWOLF 13-03-HDC07

Latitude: 41° 10.150′ N
Longitude: 73° 04.446′ W
Core length: 38 cm
Water Depth: 9.2 m
Date taken: 06/06/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no

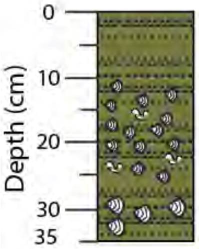


0 - 38 cm [Mud and shell beds].
Shell beds at 0 -10cm, 17-23 cm
Shells are dominated by clams, mostly mm-scale and well-preserved. Shell fragments also present



SEAWOLF 13-03-HDC08

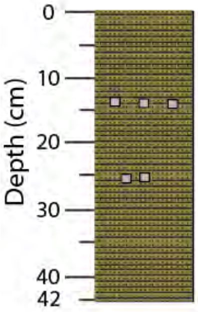
Latitude: 41° 07.540′ N
Longitude: 73° 03.508′ W
Core length: 35 cm
Water Depth: 16.0 m
Date taken: 06/06/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



0 - 13 cm [Mud with gas escape features and worm tracks]
13 - 25 cm [Mud and shell bed]
Shells are dominated by clams, mostly mm-scale and well-preserved. Shell fragments also present
25 - 35 cm [Mud]
Contains rare large (2 cm) clams with two valves

SEAWOLF 13-03-HDC09

Latitude: 41° 00.353′ N	Longitude: 73° 05.713′ W
Core length: 42 cm	Water Depth: 39.6 m
Date taken: 06/07/13	
Date described: 12/27/13	
Described by: McHugh	Flow-in: no



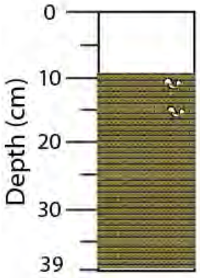
0 - 42 cm [Coarse sandy mud]
Gravel at 14 cm and 26 cm

KEY

🟩	silty clay	●	mottles-bioturbation
▨	clayey silt	■	woody material coal - slag
▨	sandy mud	□	lithics
▨	muddy sand	~	shell fragments
🟨	sand	@	shells
		—	sharp contact

SEAWOLF 13-03-HDC10

Latitude: 41° 02.952′ N
Longitude: 73° 03.372′ W
Core length: 39 cm
Water Depth: 36.4 m
Date taken: 06/07/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



0 - 14 cm [Void]
Pssibly due to core deformation during extrusion.
Upper part contained a 10 cm long worm
14 - 39 cm [Medium sandy mud]
Few scattered shell fragments 10 - 15 cm.

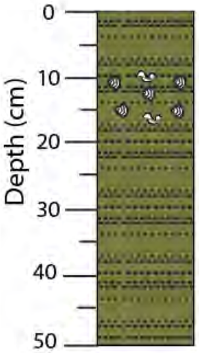
KEY

▨ silty clay
▨ clayey silt
▨ sandy mud
▨ muddy sand
▨ sand

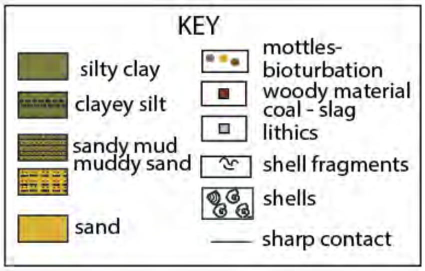
● mottles-bioturbation
■ woody material coal - slag
□ lithics
~ shell fragments
@ shells
— sharp contact

SEAWOLF 13-03-HDC11

Latitude: 41° 01.773′ N　Longitude: 73° 07.487′ W
Core length: 50 cm　Water Depth: 38.5 m
Date taken: 6/10/13
Date described: 12/27/13
Described by: McHugh　Flow-in: no

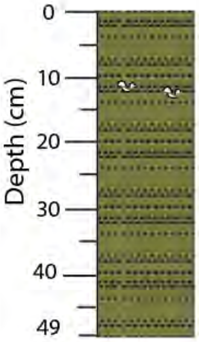


0 - 50 cm [Mud]
0 - 15 cm, gas escape features
10 - 15 cm, clam shells and fragments

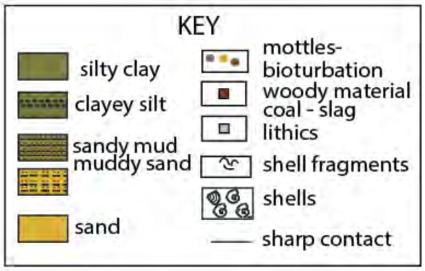


SEAWOLF 13-03-HDC12

Latitude: 41° 03.500′ N
Longitude: 73° 07.456′ W
Core length: 49 cm
Water Depth: 22.0 m
Date taken: 06/10/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no

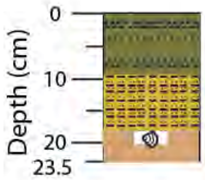


0 - 49 cm [Mud]
12 cm shell fragments



SEAWOLF 13-03-HDC13

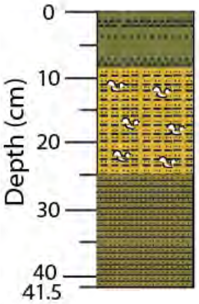
Latitude: 41° 05.103′ N
Longitude: 73° 06.321′ W
Core length: 23.5 cm
Water Depth: 46.1 m
Date taken: 6/10/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



0 - 9 cm [Mud]
9 - 18 cm [Coarse muddy sand]
18 - 23.5 cm [Reddish pink clay]
Clay contains scour surface on top and a
large (few centimeters long) shell fragment in scoured surface, a razor clam.

SEAWOLF 13-03-HDC14

Latitude: 41° 05.667′ N　　Longitude:73° 07.699′ W
Core length: 41.5 cm　　Water Depth: 19.6 m
Date taken: 6/10/13
Date described: 12/27/13
Described by: McHugh　　Flow-in: no



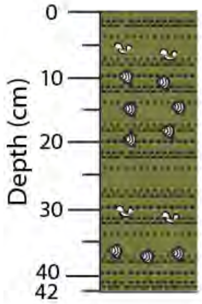
0 - 8 cm [Mud]
8 - 25 cm [Muddy coarse sand with shell fragments mm scale]
25 - 41.5 cm [Sandy mud with abundant mica]

KEY

🟩	silty clay	●	mottles-bioturbation
▨	clayey silt	■	woody material coal - slag
▨	sandy mud	□	lithics
▨	muddy sand	~	shell fragments
🟨	sand	@	shells
		—	sharp contact

SEAWOLF 13-03-HDC15

Latitude: 41° 04.066′ N	Longitude:73° 08.634′ W
Core length: 42 cm	Water Depth: 22.4 m
Date taken: 06/11/13	
Date described: 12/27/13	
Described by: McHugh	Flow-in: no



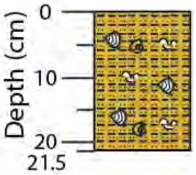
0 - 42 cm [Shelly mud]
Shells are from clams at mm scale and well preserved
Most abundant at:10 - 20 cm, 36 - 39 cm
Shell fragments at 5 cm and 30 cm

KEY

- 🟩 silty clay
- ▤ clayey silt
- ▤ sandy mud
- ▦ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- ■ woody material coal - slag
- □ lithics
- ∼ shell fragments
- ◎ shells
- — sharp contact

SEAWOLF 13-03-HDC16

Latitude: 41° 04.907′ N	Longitude:73° 06.571′ W
Core length: 21.5 cm	Water Depth: 54.4 m
Date taken: 06/11/13	
Date described: 12/27/13	
Described by: McHugh	Flow-in: no



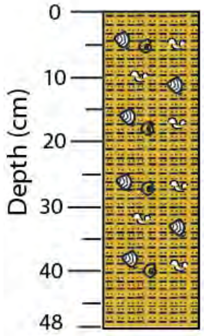
0 - 21.5 cm [Muddy coarse sand]
Large brachiopod shells up to 3.5 cm long, well-preserved. Shell fragments mm-scale throughout the core.

KEY

🟩	silty clay	●	mottles-bioturbation
▨	clayey silt	■	woody material coal - slag
▨	sandy mud	□	lithics
▨	muddy sand	~	shell fragments
🟨	sand	◎	shells
		—	sharp contact

SEAWOLF 13-03-HDC17

Latitude: 41° 06.025′ N	Longitude: 73° 05.237′ W
Core length: 48 cm	Water Depth: 18.5 m
Date taken: 06/11/13	
Date described: 12/27/13	
Described by: McHugh	Flow-in: no



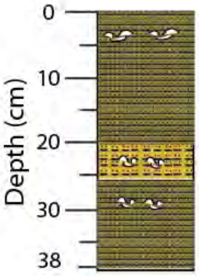
0 - 48 cm [Muddy coarse sand]
Scattered shell and lithic fragments
(i.e., subrounded quartz), mm scale.

KEY

▨ silty clay	● mottles-bioturbation
▨ clayey silt	■ woody material coal - slag
▨ sandy mud	□ lithics
▨ muddy sand	∾ shell fragments
▨ sand	◎ shells
	— sharp contact

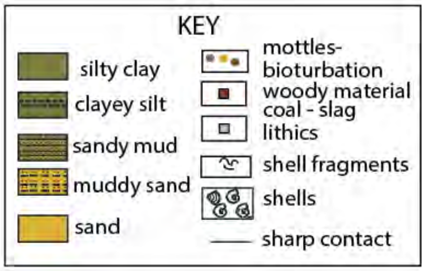
SEAWOLF 13-03-HDC18

Latitude: 41° 02.680′ N
Longitude: 73° 00.269′ W
Core length: 38 cm
Water Depth: 40.3 m
Date taken: 11/12/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



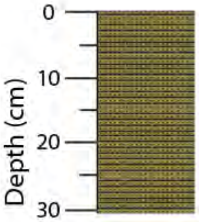
0 - 38 cm [Coarse sandy mud]
2-5 cm scattered gastropo shell
fragments and lithic clast (shale) at mm scale

21 - 25 cm [Coarse sand beds]
Brachiopod and other shell fragments from
25 to 29 cm.



SEAWOLF 13-03-HDC19

Latitude: 41° 01.622′ N	Longitude: 72° 57.458′ W
Core length: 30 cm	Water Depth: 42.1 m
Date taken: 11/12/13	
Date described: 12/27/13	
Described by: McHugh	Flow-in: no



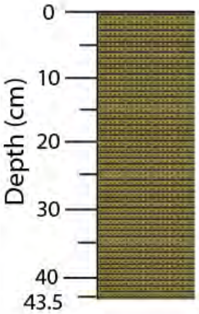
0 - 30 cm [Mud]
Tube worm at 18 cm

KEY

▨	silty clay	●	mottles-bioturbation
▨	clayey silt	■	woody material coal - slag
▨	sandy mud	□	lithics
▨	muddy sand	~	shell fragments
▨	sand	@	shells
		—	sharp contact

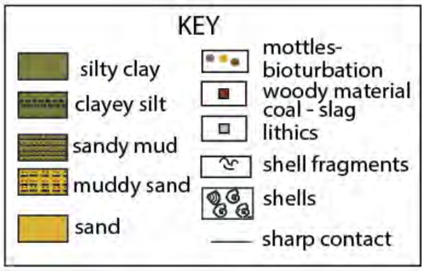
SEAWOLF 13-03-HDC20

Latitude: 41° 01.664′ N
Longitude: 73° 05.220′ W
Core length: 43.5 cm
Water Depth: 39.9 m
Date taken: 11/12/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



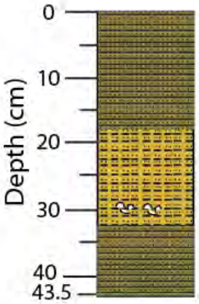
0 - 43.5 cm [Coarse sandy mud]

At 40 cm, void space 4cm long x 2 cm wide



SEAWOLF 13-03-HDC21

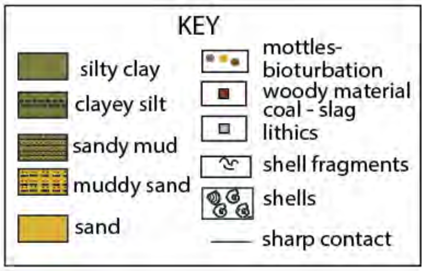
Latitude: 41° 02.426′ N
Longitude: 73° 04.966′ W
Core length: 43.5 cm
Water Depth: 33.6 m
Date taken: 11/12/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



0 - 18 cm and 33 - 43.5 cm [Coarse sandy mud]

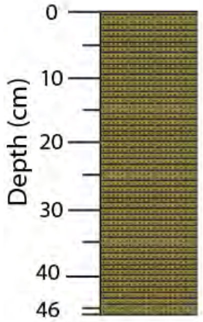
18 - 33 cm [Muddy sand]

Muddy sand contains rare shell fragments at 30 cm

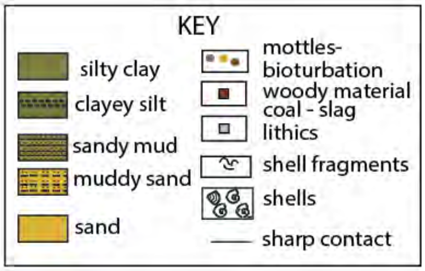


SEAWOLF 13-03-HDC22

Latitude: 41° 01.943′ N
Longitude: 73° 01.464′ W
Core length: 46 cm
Water Depth:
Date taken: 11/12/13
Date described: 12/27/13
Described by: McHugh
Flow-in: no



0 - 46 cm [Coarse sandy mud]
No shells

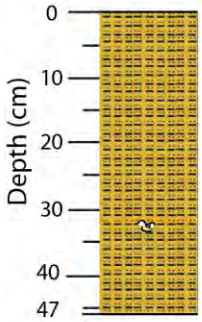


SEAWOLF 13-03-HDC23

Latitude: 41°1.349′
Core length: 47 cm
Date taken: 6/11/13
Date described: 12/27/13
Described by: McHugh

Longitude: 72°59.595′
Water Depth: 33.9 m

Flow-in: no



0 - 47cm [Coarse muddy sand]
Sand beds abundant containing angular lithic quartz fine gravel
Shell fragments at 33-34 cm

KEY

- 🟩 silty clay
- ▤ clayey silt
- ▤ sandy mud
- ▦ muddy sand
- 🟨 sand
- ● mottles-bioturbation
- ■ woody material coal - slag
- □ lithics
- ∾ shell fragments
- ◎ shells
- — sharp contact

Appendix 9: Ecological Species Lists

Stony Brook Infaunal Ecological Assessment:

Faunal data tabulated by sample and by species. Values are the number of individuals per sample.

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
ANNELIDA																														
Oligochaeta																														
Oligochaeta spp.													1				1			1										
Polychaeta																														
Ampharete arctica	27	21	26	23	52	29	21	24	29	47																				
Amphitrite cirrata													1								2	6		2	3	2	2	4	2	
Ancistrosyllis groenlandica	2		1	3		4	3	1	9	2																				
Aricidea catherinensis	14	8	24	31	58	38	16		26	1												1								
Asabellides oculata	1		1		4				3	5						2														
Asychis elongata							1														1	3		1			1			
Brada sp.									5	1																				
Brania wellfleetensis								2	3		1																			
Capitellidae spp.				1	1								2		1		4			5					1		3			
Clymenella zonalis					1				3	1													1		1	1		1	1	

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
Cossura longocirrata																	1													
Drilonereis longa					1	1	1	1																						
Eteone heteropoda										1																				
Exogone dispar	1								5	3																				
Glycera americana			2		1				1																					
Gyptis vittata													1		1			3												
Harmothoe sp.	2	8	19	9	16	13	17		1	1																				
Lumbrineris fragilis		1				1		1																						
Maldanidae sp. (juveniles)																	3													
Melinna cristata																								1	1			3	1	
Minuspio sp.											9	3	1			2	2	1	3	3					2		6			1
Nephtys incisa							1		3		10	13	15	16	12	11	10	10	8	8	5	6	4	5	11	8	18	10	10	4
Nephtys picta	2	1	3	5	4	1	6	3	6	5																				
Nereis grayi																					1					1				
Orbinia swani				1					3																					
Paranaitis speciosa	1		1		2	2																								
Paraonis gracilis								1			12	5	13	16	23	19	32	34	42	42			10	2	13	16	25	15	11	
Parapionosyllis longicirrata	14	1		1		1		1																						

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
Phyllodoce arenae		1	1	1				1																						
Polydora spp.	3			1			2		1	5	1		23	1		1														
Polygordius spp.	204	88	92	240	280	120	142	108	192	228																				
Potamilla reniformis	3	3	6	3	3	1	3																							
Sabellaria vulgaris				1																										
Scalibregma inflatum		3				1	1		5																					
Schistomeringos caecus					1	1																								
Scolelepis squamata											3	1	1					1	2	3										
Sigambra sp.											3	8	3	11	9	5	12	10	5	39	2	1	3	13	16	16	25	8	7	
Sphaerosyllis erinaceous						1																								
Spiochaetopterus oculatus																						1								
Spiophanes bombyx	5	7	1	4		6	5	1	19	7																				
Terebellidae spp.	1																													
Tharyx sp.			12	19	23	11	9		1			1		1	2		1			1				1			1	1		
ARTHROPODA																														
Amphipoda																														

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
Ampelisca vadorum	9	96	81	102	26	59	62		53	11	1		1	4		1		3	1							1				
Corophium sp.		1							12	5																				
Dulichia sp.			1															1												
Erichthonius brasiliensis			1	4		3	1																							
Leptocheirus pinguis	9	69	2	67	21	18	41	5	259	65																				
Luconacia incerta (Caprellid)				10	1	4	2																							
Metopella sp.					1																									
Parametopella cypris				1						1																				
Paraphoxus spinosus						2																								
Phoxocephalus holbolli	6	4	4	20	8	4	9																							
Stenothoe minuta	1	3	3	5			1																							
Unciola irrorata	4	11	4	4	3	5	2	2	25	5						1														
Cephalocarida																														
Cephalocarida sp. (possibly H. macracantha)																									2			1	2	
Cirripedia																														
Balanus amphitrite	10	3			110	25	7			1																				

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
Cumacea																														
Oxyurostylis smithi														1				2						1						
Decapoda																														
Brachyuran (true crabs)																														
Panopeus herbstii	1	1	6	4	2	4	3		1	1			1																	
Pinnixa sp.		5		1		2		1	4	4	1		5			1					1	2					1			
Portunidae sp. (juv: *C. maenas/O.cellatus*)	1																													
crab megalops																									1				1	
Caridean (shrimp)																														
Crangon septemspinosa			1					1	1																					
Ghost Shrimp																														
Gilvossius setimanus							1																	1						

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
Shrimp (juvenile)								1																						
Isopoda																														
Cyathura polita																						1						1		
Mysidacea																														
Heteromysis formosa					1																									
Neomysis americana																												1		
Tanaidacea																														
Leptochelia savignyi								4																						
CHORDATA																														
Ascidiacea																														
Molgula sp. (probably *M. manhattensis)*		2							7			1					1	1												
CNIDARIA																														

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
Actinaria spp.													1	1	1		1					2							1	1
MOLLUSCA																														
Bivalvia																														
Anadara transversa	2	3	2	4	1	2	3	2	6																					
Astarte undata		4	2	2	2	2	7	1	1	3																				
Bivalvia juvenile (possibly *Crassinella* sp)	1										1																			
Ensis directus		1	1				1																							
Lyonsia hyalina		6	1	3	2	1	1	5	8	1																				
Macoma tenta									2					1																
Mulinia lateralis								2			4		2	1	1					1			1							
Mytilus edulis	1	3	2	6	3	18	7			3																				
Nucula annulata											14	34	44	36	2	2	1	2	2	6							1			
Pandora gouldiana						1				1																				
Pitar morrhuanus		4					3	1	8	3	7	3	3	1	1	1				3	3		3	1	2			1		1
Tellina agilis	2	2						5		2																				
Yoldia limulata											10	3	5	2	1	1	1	2	1	6		1				1				

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
Gastropoda																														
Acteocina canaliculata											5		4	1	6	4	2	4	5	6					1			1		
Anachis avara						1					1	1																		
Crepidula fornicata			1																											
Crepidula plana	1																													
Gastropoda juveniles	118				12	8		5					1																	
Ilyanassa trivittata		1		1					2			4	1	1		3		1	4	3			1				4	2		
Naticidae spp.		1		2		1						3		1	1															1
Turbonilla sp.																						1								
Urosalpinx cinerea												1																		
PLATYHELMINTHES																														
Stylochus ellipticus																									1					
ECHIUROIDEA/SIPUNCULA				5		6	2		8	1	1				1															
Number of Species	28	30	28	32	28	35	31	24	33	28	17	14	21	16	14	14	14	14	10	14	7	11	7	10	13	8	11	13	9	5

	1	2	3	4	5	6	17	18	19	20	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25	26	27	28	29	30
	S	S	S	S	S	S	S	S	S	S	M	M	M	M	M	M	M	M	M	M	SM	SM	SM	SM	SM	SM	SM	SM	SM	SM
Sample ID	**L001**	**L002**	**L003**	**L004**	**L005**	**L006**	**L017**	**L018**	**L019**	**L020**	**L007**	**L008**	**L009**	**L010**	**L011**	**L012**	**L013**	**L014**	**L015**	**L016**	**L021**	**L022**	**L023**	**L024**	**L025**	**L026**	**L027**	**L028**	**L029**	**L030**
Notes:																														
1. sp. = single species																														
2. spp. = multiple species																														
3. S=Sand, M=Mud, SM=Sandy Mud																														

LISMARC Infaunal Ecological Assessment

Summary species lists from Fall 2012 and Spring 2013 infaunal acoustic patch Similarity Tables

Fall 2012

Polydora cornuta
Sigambra tentaculata
Pinnixa rectinens
Amphitrite ornata
Pinnixa sayana
Levinsenia gracilis
Gilvossius setimanus
Hutchinsoniella macracantha
Nephtys incisa
Ceriantheopsis americanus
Sabaco elongatus
Nucula proxima
Owenia fusiformis
Yoldia limatula
Oligochaeta
Pitar morrhuanus
Acteocina canaliculata
Prionospio steenstrupi
Clymenella mucosa
Nemertia
Mediomastus ambiseta
Turbonilla spp.
Corophium spp.
Ampharete acutifrons
Nephtys spp.
Cossura longocirrata
Mytilus edulis
Phoronida
Stenopleustes inermis
Polydora spp.
Rithropanope harrisi
Anadara transversa
Crepidula plana
Tellina agilis
Erichthonius brasiliensis
Parapionosyllis longicirrata
Spiophanes bombyx
Nephtys picta
Spiochaetopterus oculatus
Caprellidae
Ilyanassa trivittata
Mulinia lateralis
Ampelisca vadorum
Ampelisca macrocephala
Ancistrosyllis groenlandica
Astarte undata
Leptocheirus pinguis
Paraonis fulgens
Ampelisca abdita
Maldane sarsi
Turbellaria
Mollusca
Macoma tenta
Polychaeta spp.
Aglaophamus verrilli
Amphipoda spp
Clymenella torquata
Cirratulus grandis
Scalibregma inflatum
Ampharete spp.
Aricidea spp.
Spionidae
Diopatra cuprea
Spio setosa
Harmothoe imbricata
Glycera americana
Orbinia ornata
Tharyx acutus
Ampharete americana
Epitonium spp
Crepidula fornicata
Ampelisca spp.
Ensis directus
Pherusa affinis
Cancer borealis
Exogene spp.
Trichophoxus epistomus

Spring 2012

Nucula proxima
Nephtys incisa
Sigambra tentaculata
Levinsenia gracilis
Yoldia limatula
Acteocina canaliculata
Bostrichobranchus pilularis
Phoronis spp.
Pitar morhuanna
Nephtys spp.
Amphitrite spp.
Pinnixia sayanna
Mulinia lateralis
Amphitrite spp
Ampelisca abdita
Turbonilla elegantula
Unciola irroata
Oligochaeta
Asychis elongata
Owenia fusiformis
Nemertea
Gilvossius setimanus
Archiannelida
Tellina agilis
Leptocheirus pinguis
Ampharete americana
Ampelisca spp.
Paradoneis lyra
Spiophanes bombyx
Anadara transversa
Mollusca
Naissarius trivitattus
Nephtys picta
Lyonsia hyalina
Aricidia spp.
Panopeus herbstii
Harmothoe extenuata
Leptocherius pinguis
Mytilus edulis
Acmira catherinae

LISMARC Emergent and Epifaunal Ecological Assessment

Lists of all benthic invertebrates and biogenic features, based on lowest identifiable taxon, enumerated from seafloor images. Habitat forming species are a subset of all invertebrates.

Invertebrates	Biogenic features	Habitat forming species
Arbacia_punctulata	Crepidula fornicata (Dead)	Astrangia_poculata
Astrangia_poculata	Ilyanassa trivittata (dead)	Balanomorpha_Barnacle
Balanomorpha_Barnacle	Mercenaria shells (Dead)	Cliona spp.
Cancer irroratus	Euspira_spp_dead	Crepidula fornicata (Live)
Cliona spp.	Mytilus edulis (dead shell)	Demospongiae_1
Crab_Brachyura	Ensis_directus	Hydroides_dianthus
Crepidula fornicata (Live)	Mud_tube	Hydroidolina_Cheilostomatidae
Demospongiae_1	Worm_mound	Mytilus edulis
Pagurus_spp_small	Worm_castings	Diopatra_cuprea
Pagurus_spp_large	Carapace_fragment	Demospongiae_2
Hydroides_dianthus	Crassostrea_virginica_dead	Bivalve_siphons_1
Hydroidolina_Cheilostomatidae	Mud_tube_on_surface	Bivalve_siphons_2
Libinia spp	Andara_spp_dead	Ceriantheopsis_americana
Mytilus edulis	Astarte_undata_dead	Diadumene_leucolena
Demospongiae_2	Mucus_strands	Demospongiae_3
Bivalve_siphons_1	Astrangia_poculata_dead	Crassostrea_virginica
Bivalve_siphons_2	Aoridae_tubes	Bostrichobranchus_pilularis
Ceriantheopsis_americana	Terrestrial_vegetation	Corymorpha_pendula
Diadumene_leucolena	Anomia_spp_dead	Bryozoa_encrusting
Demospongiae_3	Algal_debris	Halichondria_sp
Limulus_polyphemus	Libinia_spp_dead	Worm_pink
Crassostrea_virginica	Shell_hash	Astarte_undata
Henricia_sanguinolenta	Shells_intact	Styela_canopus
Bostrichobranchus_pilularis	Biogenic_depression	Rhodophyta_filamentus
Polychaeta_tentacles	Burrow_medium	Perophora_sp
Corymorpha_pendula	Burrow_large	Ectopleura_spp
Crustacea_shrimp	Burrow_wide	
Aoridae_amphipod	Burrows_small	
Nudibranchia_1		
Bryozoa_encrusting		
Halichondria_sp		
Worm_pink		
Astarte_undata		
Pycnogonida		
Styela_canopus		
Euspira_spp		
Perophora_sp		
Euspira_spp_egg_case		

Asterias_forbesi
Busycotypus_canaliculatus
Nudibranchia_2
Ectopleura_spp
Gastropoda_small

List of all taxa and biogenic features enumerated from seafloor imagery during fall 2012 and spring 2013 surveys.

Taxon	Taxon
Arbacia_punctulata	Astrangia_poculata_dead
Astrangia_poculata	Crassostrea_virginica
Balanomorpha_Barnacle	Henricia_sanguinolenta
Cancer irroratus	Bostrichobranchus_pilularis
Cliona spp.	Polychaeta_tentacles
Crab_Brachyura	Corymorpha_pendula
Crepidula fornicata (Dead)	Aoridae_tubes
Crepidula fornicata (Live)	Crustacea_shrimp
Demospongiae_1	Aoridae_amphipod
Pagurus_spp_small	Nudibranchia_1
Pagurus_spp_large	Bryozoa_encrusting
Hydroides_dianthus	Halichondria_sp
Hydroidolina_Cheilostomatidae	Terrestrial_vegetation
Ilyanassa trivittata (dead)	Worm_pink
Libinia spp	Astarte_undata
Mercenaria shells (Dead)	Pycnogonida
Euspira_spp_dead	Styela_canopus
Mytilus edulis	Anomia_spp_dead
Mytilus edulis (dead shell)	Euspira_spp
Ensis_directus	Rhodophyta_filamentus
Prionotus_spp.	Algal_debris
Loligo_pealeii	Perophora_sp
Menidia_spp_juvenile	Pleuronectes_americanus
Urophycis_spp	Euspira_spp_egg_case
Stenotomus_chrysops_juvenile	Asterias_forbesi
Centropristis_striata_juvenile	Libinia_spp_dead
Tautogolabrus_adspersus	Busycotypus_canaliculatus
Actinopterygii_unidentified	Nudibranchia_2
Diopatra_cuprea	Ectopleura_spp
Mud_tube	Shell_hash
Worm_mound	Shells_intact
Worm_castings	Biogenic_depressino
Carapace_fragment	Burrow_medium
Demospongiae_2	Burrow_large

Taxon
Bivalve_siphons_1
Bivalve_siphons_2
Crassostrea_virginica_dead
Mud_tube_on_surface
Andara_spp_dead
Astarte_undata_dead
Ceriantheopsis_americana
Diadumene_leucolena
Demospongiae_3
Burrow_wide
Shells_intact_all
Burrows_small
Gastropoda_small
Mucus_strands
Limulus_polyphemus